CALIFORNIA FISH AND GAME

"CONSERVATION OF WILD LIFE THROUGH EDUCATION"

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SOME NOTES ON DRY-FLY FISHING.

By R. L. M., California.

There is really no mystery in connection with dry-fly fishing; everybody who has fished with the wet fly must have noticed that the first time that a new or dry-fly is cast on the water, that it remains on the surface; in other words, it floats. As soon as the fly becomes wet it ceases to float and thus becomes a wet fly. Now, dry-fly fishing merely consists in keeping the fly dry, and if it should become wet, of drying it with as little loss of time as possible.

Owing to more or less recent discoveries, several aids have been found which greatly assist the fisherman in keeping his fly from becoming waterlogged. The most important of these is the "oil tip." The honor of this discovery belongs to the late Thomas Andrews, of Surrey, England, who obtained it from Colonel Hawker, a descendant of Colonel Peter Hawker (Diary 1802-53; "Hints to Young Sportsmen"). "Odorless paraffine" is the fluid generally mentioned. This is not always easy to obtain. However, there is another oil that from my own personal experience is equally efficacious. I refer to the well known and useful "3 in 1." The best method of applying "3 in 1" to a fly is to dip the fly in the oil, then lay it on a piece of

blotting paper to drain while breakfast is being eaten. A fly treated in this manner will continue to float bone dry until it is worn out or the day's fishing is over.

Another very useful thing to have at the waterside is a piece of amadou. This substance, which looks like leather, is a fungus that has the property of rapidly absorbing moisture. If the fly is *very wet* it can be pressed between a folded piece of amadou and nearly all the moisture is removed.

But all said and done, most of the drying out of a fly is done by switching or casting the fly back and forth in the air. Anybody who is able to throw a fly can in a very short time learn how to do this without snapping off his fly.

The first thing to remember is that the fly should not be thrown *at* the water. Learn how to cast the fly so that all the impetus imparted to the line is used up by the time the fly is still *above* the surface of the water, and allow the fly to fall of its own weight on the water.

Now, when this feat can be accomplished with ease, instead of letting the fly fall on the water, make a backward stroke similar to that which is made when picking the line and fly off the water; this will extend the line behind. A series of three or four of these backward and forward strokes (which are called false casts) are made between each true cast, and this action called "drying the fly" is the principal thing that differentiates between wet and dry-fly fishing. Of course, there are other things to be taken into account, about which I hope to say more at some later date, but the whole secret consists of being able to throw the fly backwards and forwards in the air without permitting it to touch the water in front or the ground behind. When that can be done the major part of the art is conquered.

In actual practice the false casts will be made at an elevation corresponding roughly to the top of the rod, whether the overhead or horizontal cast is being used.

I strongly advise the beginner to commence his dry-fly fishing with hackle flies, for the following reason: A hackle fly, having no wings, is always "cocked up"; whereas, a winged fly should float with its wings standing up in the air, and placing such a fly on the water properly "cocked up" does not come to one overnight. But as soon as the beginner becomes proficient in putting a hackle fly lightly on the water he can switch to the winged variety and note results. If the fly persists in floating on its side, *i.e.,* with one or other wing in the water, it shows that there was too much force used in making the cast; because the fly, instead of falling of its own weight onto the surface, was propelled thereon, with sufficient force to topple it over on its side. As time goes on, however, the fly will more often fall correctly and float lightly on the surface with an extraordinary resemblance to the natural insect.

Do not become discouraged if you do not become an expert dry-fly fisherman in a few days. Have patience and be persevering and in a surprisingly short time, all things considered, you will find yourself accomplishing things you once considered almost impossible. The great test of the art is to be able to tell when a fly is dry or otherwise, by the feel of the line when making the false or drying casts. When you can do this your novitiate is in the past.

NOTE ON THE HABITS AND USE OF THE SMALL SAND CRAB (Emerita analoga).*

By FRANK W. WEYMOUTH, Stanford University.

Of the many baits used for surf and pier fishing in southern California, few are more popular than the "soft-shelled" sand crab, of which numbers may be seen for sale in the fish markets on the piers at Santa Monica, Venice, Long Beach, Coronado and other coast towns. Some recent observations on its habits suggested that those who use it as bait might be interested in its mode of life and where it may be caught.

The small sand crab, as it may be called to distinguish it from a larger form also found in the sand, or more technically *Emerita analoga*, is found on sandy beaches exposed to the open ocean along the entire coast of California, but never in bays or other sheltered locations. The reason for this will be clear when we have considered its feeding habits. At the level washed by the waves it burrows in the sand, and is found grouped in beds which can be recognized even at a distance by peculiar diamond-shaped ripple marks in the water running off the sand after the breaking of the wave. These ripples are caused by the feathered "feelers," or antennæ, of the sand crab, which it thrusts up into the receding wave. With these it combs from the water the microscopic animals and plants upon which it feeds.

If one has patience to wade into such a bed and wait quietly until the crabs have recovered from their first alarm, the interesting process of feeding may easily be watched. As the water clears of sand after the inrush of the wave, dozens of pairs of the plume-like antennæ will be seen to pop out of the sand into the seaward-running water, where they remain until the wave drains off, occasionally disappearing for a fraction of a second to be freed of their catch of tiny organisms. Corresponding to this habit of feeding on material too fine to be chewed, the jaws, which have hard-cutting edges in other crabs, are here small, soft, degenerate vestiges.

If a shovel is thrust into the sand of one of these "beds" it will turn out scores of these crabs which "dig in" again so rapidly that few can be caught. If numbers are wanted the best way to catch them is to shovel the sand, crabs and all, into a box having wire screen in the sides, and let the sand be washed out by the waves as they sweep in and out. Another but less efficient method sometimes practiced is to hold a screen across one of the sand gullies found in this part of the beach and so catch the crabs which happen to be swimming about in the receding wave.

Observations recently made show that the crabs move up and down the beach with the tides so that the beds may always be found in the area washed by the waves, and here they may easily be recognized by the ripple marks already mentioned.

Crabs caught by any of these methods will be noticed to differ much in size. In this species, unlike most of the crustacea, the males are much smaller than the females, and it will be found during the breeding season, which falls in the summer months, that only the

*California State Fisheries Laboratory, Contribution No. 8.

larger specimens are carrying egg masses. The "soft-shelled" crabs are, of course, not a separate form, but only those that have recently molted or cast their shells, a process occurring yearly in most crustaceans, and that have not yet hardened their new shells. According to observations just made, the molting of the large females apparently occurs just before spawning and in advance of the molting of the males, and it is these "soft" females which are collected as bait for surf fishing. Fish are apparently used to feeding on these crabs, which in their soft state have more difficulty in burrowing into the sand than at ordinary times and are therefore more likely to be found swimming about at the bottom. The fisherman, in using the "soft-shelled" sand crab, is therefore offering to the fish one of its customary dainties, and it is readily accepted.

GAME CONDITIONS IN SOUTHERN CALIFORNIA THIRTY-FIVE YEARS AGO.

By M. HALL McALLISTER.

In 1885, I spent the summer and fall in and near Colton, Riverside and San Bernardino, in southern California, and most of the months of September, October and November in riding and hunting all over that part of California. My companion was a rancher, V. C. Reche, who was one of the best shots, deer trackers and general all-round hunters to be found anywhere.

We had one week's hunt on the Santa Margarita, also known as the Juan Foster-Dick O'Neill-Flood property, near Oceanside. Our party of four bagged fourteen deer and could have killed double the number, but stopped shooting because they were nearly as tame as sheep.

There were then some antelope just south of Riverside, and I have now the horns of a buck killed not far from San Jacinto Mountain, near where the town of Hemet now stands. Mountain sheep could then be found in either the San Bernardino or San Jacinto ranges, and my hunting friend Reche had killed several. I also remember a miner who reported a very large grizzly as coming daily to the mountain side near a mine to feed on the berries. This mine was on the desert side of the Cajon Pass where the Santa Fe Railway comes down from Barstow. Mountain lions were also plentiful all through these ranges. I remember a friend reporting that while riding through a canyon not far from his ranch he suddenly came on a bunch of five lions feeding on a dead calf, and as he had no weapon with him he thought best to make a quiet sneak.

On the San Jacinto plains south of Riverside were a few springs, and to these the quail came in countless thousands to water, and at nearly each one of them we found a brush hut and a V-shaped trough placed there by the quail market hunters. Reche and I went around and burned up each and every one of these "slaughter pens" and got ourselves somewhat disliked when the news leaked out as to who had done it.

When the quail season opened in September we had many splendid hunts, but no potting was allowed, wing shooting only; and with birds so plentiful, we had wonderful sport. I remember one hunt where we slept out at one of these San Jacinto plains springs and in the morning saw the enormous bands of quail coming up for water. It made one's blood tingle with excitement. The ground for hundreds of yards all around was a moving mass of thousands of running birds. We hid in the brush and let them come in to water, then suddenly jumped up with a shout and succeeded in scattering the flock so that in an hour's shooting we had bagged 97 quail, all wing shots. We did not move more than one hundred yards from the spring, as every rock on the hillside had from one to a dozen quail under it.

Mr. Reche stated that when the Sunset Route of the Southern Pacific started in 1880, many young men in southern California started hunting quail for the San Francisco market, but that nearly all the quail rotted in the sacks before reaching San Francisco, so that the business proved unprofitable. Before refrigeration could be arranged, the big bands of quail were all killed off. He stated that with his brother he started to shoot for the market, but his returns did not pay the express charges and the cost of powder and shot. He stated that by actual count he picked up 363 quail as a result of eleven pot shots of his old muzzle loader at the spring where we found the V-shaped trough. This was an average of 33 birds to each shot, and he said he would wait until the trough was actually covered with quail before he would shoot.

Coming back to recollections in and around my home in San Francisco, I remember that in the summer of 1875 I visited a camp of young men in the mountains back of Pescadero, in San Mateo County. This was in July and there was a game law against shooting quail, but these men, "just for the fun of it," were potting quail by the hundreds and had a large sack full; in fact, so many that their camp could not eat them and we were invited to "help yourself if you will keep your mouth shut."

In the California Market, San Francisco, in the seasonal months from September to February, the oyster cafes served "quail on toast, 25c," and when I lunched there my daily order was this most palatable dish.

Remembering the adage, "You can not eat 30 quail in 30 days," I tried and accomplished the feat. It was supposed the adage came from the idea that a person could not obtain quail on each day of thirty consecutive days or that you would so tire of them that you could not carry out your bargain. However, as stated above, I did obtain and did eat a quail each day for thirty consecutive days. I might state that the restaurant had a fine cook who understood how to prepare them with plenty of butter, and they were delicious.

As I was working and had to keep regular office hours in San Francisco, most of my hunting was on Saturdays and Sundays and occasional holidays and vacations. I have a journal and record book of all my hunts from 1877 down to the present year, 1919, just forty-two years. Most of the shooting has been at ducks and geese on the Suisun marsh, where I was a member of the Cordelia and Ibis shooting clubs.

A CASE OF DESTRUCTION OF PISMO CLAMS BY OIL.*

By PROFESSOR FRANK WALTER WEYMOUTH, of Stanford University, California.

That crude oil is harmful to marine and fresh water animals has been so generally recognized that most states, including California, have passed laws designed to protect their waters from oil by providing penalties for those who allow it to escape. Definite instances proving its destructive effect though present, for instance in the case of water birds, are not numerous, and for this and other reasons convictions are not always easy to obtain. It is claimed by the clam diggers at Pismo and Oceano that oil is chiefly responsible for the decrease in the supply of Pismo clams. It is hoped that at another

Fig. 55. Oil cakes on the beach near Pismo. The size may be judged by comparison with the cap. Photograph by W. E. Weymouth.

time it will be possible to present an analysis of this claim and of other factors influencing the abundance of this important food mollusk, the data for which are not now available, but an instance of the effect of oil which recently came under the writer's notice may here be put on record.

Sometimes oil reaches the beach from tanks on the shore near Avila, but the most important source is from the water ballast discharged by vessels coming to load oil at Port San Luis. This can not reach the beach at Morro around the projecting "Pecho" coast against the prevailing winds, but is blown on the beaches at Pismo and Oceano at times in considerable quantities as bathers at these resorts are

*California State Fisheries Laboratory, Contribution No. 11.

well aware. One such instance was observed by the writer on June 1 of the present year, when along more than a mile of the beach just south of Pismo large masses of fresh oil were found scattered over the wet sand exposed at low tide. The appearance at two points is shown by the accompanying photographs, from which the size and abundance of the oil cakes may be judged. In fact, at this time it was impossible for a bather to cross the beach without getting so much oil on his feet as to make a gasoline footbath necessary. Many old cakes well mixed with sand and free of the thinner oils may be seen at any time high up on the beach, showing that the occurrence is by no means rare. On the date mentioned the lighter parts of the oil, churned up by the surf into an emulsion, were found sweeping back and forth across the sand at the tip of the advancing waves, and in this were large numbers of small animals either dead or so feeble as no longer to be able to burrow. About a quart of small clams, chiefly razor shells (*Siliqua*), but including some thirty small Pismo clams (*Tivela*), together with a few sand crabs (*Emerita*) and some worms were picked up in a few minutes. All were smeared with oil; some of the clams were dead and gaping, others were alive, but too feeble to keep up the constant burrowing necessary to maintain their place in the sand from which the waves had washed them. Whether the oil killed them directly or, what is more probable, by filming over the sand cut off the supply of air, could not be determined. But that they were killed by the oil can not be doubted, as examination of the beaches for two or three weeks before and after this date seldom showed even a single dead clam except in the presence of oil.

With this clear proof of the destructive effect of the oil on such an important food animal as the Pismo clam, there can be no excuse for tolerating the escape of oil, especially as it has been proved possible by devices in use on many tankers not only to prevent its escape, but to save the oil thus usually lost.

If you are inclined to criticise the Fish and Game Commission, read the following criticisms and the defense.

If you believe in the work of the Commission, inform yourself more fully as to the accomplishments of the past few years.

ACCUSATIONS AND THE DEFENSE.

Resolution by Mr. Eden, introduced in the State Legislature April 1, 1919, and referred to Committee on Governmental Efficiency and Economy.

WHEREAS, The Fish and Game Commission of this state, and its several members, officers and assistants, are, by virtue of the very large power and authority given to them by law, in a position to exert great influence for or against legislation pending before this Assembly; and

WHEREAS, It is said that certain of said officers and members have in fact sought to influence pending legislation; and

WHEREAS, Said Fish and Game Commission and certain of its members, assistants and employees have been derelict in the performance of the duties imposed upon them by law; now, therefore, be it

Resolved, That the Committee on Efficiency and Economy of this Assembly be and it is hereby, directed to make an immediate and thorough investigation of the following specific matters:

1. To ascertain what, if any, fishing clubs, gun clubs and private game preserves, any of the said commissioners, or the officers, assistants or employees of said Fish and Game Commission, are affiliated with; and whether or not any of said officers, assistants or employees have been, by reason of such affiliation, perniciously active in supporting or opposing any legislation now pending before this Assembly; and whether or not they have shown any favoritism, in any manner, towards any gun or fishing club members; and whether or not they have, by reason of their said membership, sought to set up and perpetuate in this state, against the interests and wishes of the common people, the European system of a monopoly in the control and use of wild fish and game, which is peculiarly the property of all the people.

2. Why it is that within the past nine years said commission has, without any satisfactory explanation, dismissed three certain executive officers of said commission, each of whom was reputed to be a faithful and efficient public servant.

3. How much of the time of the present attorney of said commission is devoted to the duties of his state office, and how much of it is devoted to his own private law practice; the latter of which is said to be very large and lucrative.

4. Why said commission collected from the people of the State, during the four years ending June 30, 1918, the enormous sum of $837,409.25, of which the sum of $708,310.75 was expended; whether or not said sum so spent was not unwisely and extravagantly used. Also recommend some legislation that will reduce the amount of money collected by said commission at least $30,000 per annum. Also to ascertain if it is not advisable that the expenditure of such a large fund should be made by the governing body of the State, upon appropriations, instead of by said commission, as is now done, without any control of the Legislature whatever.

5. Why it is that for the two years ending June 30, 1918, the police work of the commission fell off about 15 per cent over the preceding two years (see last report to Governor, page 88); notwithstanding said commission is charged with the enforcement of laws for the preservation of fish and game, and notwithstanding more people hunted and fished during said period ending June 30, 1918, than before; and notwithstanding reports of frequent and flagrant violations of the fish and game laws were reported in the press and otherwise throughout the state.

6. Why said commission expended the enormous sum of $68,272.21 to establish and a large sum since for additions to a trout hatchery in Inyo County, for the purpose, as avowed by the said commission, of stocking the streams of southern California and the western slope of the southern Sierra Nevadas, when it was obvious to any person that said location could not be a success for the following reasons:

a. That there were no waters nearby needing to be stocked.

b. That it was impossible to obtain a sufficient supply of trout eggs in that vicinity for hatching purposes.

c. The great distance the hatchery product must be transported at heavy expense.

d. The hatchery product must be transported through the heat of the Mojave desert before they reach the waters intended to be stocked.

7. To ascertain the cost of maintenance and operation of said hatchery in Inyo County, and whether the said cost is not extravagantly expensive and out of all proportion to the benefit derived by the people of the state, and likely to be a growing burden and expense; also the person from whom the ground was purchased and the then owners of adjacent property and the price paid therefor.

8. To ascertain whether or not the commission is making any intelligent and sufficient effort to obtain accurate first-hand information relative to the present status and condition of the game and fish of the state; and whether or not by reason of failure to procure such information many species of game and fish have reached the point of actual extinction, with others in the same dangerous stage of diminution, before proper conservation measures can be proposed to this Assembly.

9. Why said commission has permitted the Truckee River, one of the most beautiful streams in the world, and a famous fishing ground, to remain polluted for years by the waste products from a paper mill located at Floriston, California, notwithstanding popular complaint and objection by the citizens, not only of our state, but also by the people of our sister state, Nevada, whose principal city obtains its domestic water supply from said river; and notwithstanding said commission is required by law, and clothed with all lawful authority, to prevent the pollution of streams. Why it is that in the face of the law said commission has deliberately and wilfully failed and refused to do its plain duty, thereby constituting a clear and flagrant malfeasance in office, and one that should be severely dealt with by the proper authorities.

10. Why it is that the ocean waters of San Luis Obispo County and the waters of San Pablo and San Francisco bays, and other navigable fishing waters in the state, have been for years, and are now, being polluted with crude petroleum, oil refinery refuse and other substances deleterious to fish life, in violation of law; notwithstanding it is the duty of the Fish and Game Commission strictly and impartially to enforce the law against such pollution.

11. To ascertain whether or not, throughout the state, in irrigated districts, many canals and irrigating ditches are diverting water from streams that contain fish, without using screens to prevent the loss of fish; and thereby millions of trout, bass and other valuable food and game fishes are annually killed and wasted.

12. To ascertain to what extent dams and other artificial obstructions are being suffered by the said commission to be maintained in the streams of the state without proper fish ladders, and whether or not by such neglect and dereliction of duty on the part of said commission, millions of trout, and other migratory fish, are prevented from reaching proper "spawning beds," with a resultant loss of a great quantity of fish spawn and fish.

13. To ascertain if it is not true that the Fish and Game Commission has failed and neglected to take advantage of that provision in the law authorizing the creation of game refuges on private land holdings, resulting in game, in many sections where hunting is intensive, failing to receive proper and adequate protection.

14. Why said commission has discontinued a branch office established at the request of the people of the San Joaquin Valley; thus making less effective the supervision of police and other conservation activities in that important and developing region; and thereby, and through other activities, having lost to the state the services of one of the most efficient and conscientious fish and game conservationists in the country.

15. To ascertain if it is not true that said commission has wasted large sums of the people's money in unscientific and impractical experiments at its game farm at Hayward, California, and has finally abandoned said farm.

16. To ascertain if it is not true that the distribution of fish, as carried on by said commission, is unscientific, unduly expensive and results in the destruction each year of a large proportion of the fish so distributed.

17. To ascertain if it is not true that because said commission has failed to investigate and prevent enormous losses occurring among the millions of young salmon propagated and distributed each year after they leave the hatcheries, the salmon fisheries of the Sacramento and San Joaquin rivers are not being kept in a healthful and thriving condition.

18. To ascertain to what extent, if any, said commission has, within the past eight years, been governed by political, personal and other insufficient and improper motives, in its acts in the following particulars:

a. The dismissal of trained and efficient employees.

b. The employment, promotion and otherwise rewarding of assistants and employees not deserving of such consideration.

c. The failure to promote certain assistants deserving promotion.

And whether it is not true that by reason of said acts the entire department is demoralized and functioning very inefficiently and at an expense out of all proportion to the results obtained.

19. To ascertain if it is not true that the force of wardens in the field, where the fish and game are to be found and where constructive work can only be done, is inadequate; while the "overhead" has been constantly increased by adding to it expensive and unproductive clerical workers; be it further

Resolved, That said committee report to this Assembly within a short time, the result of its investigation, with such recommendations as it may deem advisable; be it further

Resolved, That said committee be, and it is, hereby authorized and empowered to compel the attendance of witnesses at its several sessions, by subpœnas, to be served by the clerk of said committee; and that the chairman and vice chairman of said committee be and they are each of them authorized to administer oaths to witnesses; and any witness refusing to answer questions is hereby declared to be in contempt, and may be punished as for contempt.

Said committee is empowered to employ all needed clerical and expert assistance to carry on said investigation, and all costs and expenses of such investigation shall be paid out of the Contingent Expense Fund of this Assembly, not exceeding one thousand five hundred dollars.

Reply to the Eden Resolution by the Executive Officer of the Fish and Game Commission.

In the preamble of Mr. Eden's resolution introduced in the Assembly, April 1, 1919, it is stated that some of the members, officers and assistants of the Fish and Game Commission appear before the Legislature. While this is true, they do so merely in an advisory capacity and have not at this or any other session of the Legislature, attempted to influence any legislation for personal motives. They have favored the legislation which they thought was best for the conservation of the fish and game of this state and have opposed legislation which, in their opinion, was harmful or vicious.

A general statement is made that certain members, assistants and employees of the commission have been derelict in the performance of the duties imposed upon them by law, but no specific instances have been enumerated. The statement is untrue. Assistants or employees found derelict in the performance of their duties have been promptly discharged from the service of the commission.

The following is a brief reply to each of the nineteen points set up in the resolution:

1. The fact that two of the three commissioners are members of gun clubs has in no way influenced them in showing any favoritism towards gun clubs nor have they been perniciously active in supporting or opposing legislation pending before the Assembly, nor have they sought to establish the European system of monopoly in the control and use of fish and game, against the interests and wishes of the common people. On the contrary, they have always sought to perpetuate fish and game in this state for the benefit and use of all the people. Commissioner Bosqui is not a member of nor in any way affiliated with any hunting or fishing club nor with any game or fishing preserve.

2. It is not true that within the past nine years the Fish and Game Commission has dismissed three executive officers of the commission. Charles A. Vogelsang severed his connection with the commission long before Commissioners Newbert and Bosqui were appointed and several years prior to the time the present executive officer became connected with the commission.

John P. Babcock, after several conferences with Governor Hiram W. Johnson, resigned on November 24, 1911.

Ernest Schaeffle voluntarily resigned on September 15, 1916. Both resignations are now on file in the office of the commission.

3. Mr. Robert D. Duke, attorney for the commission, devotes all of his time to the duties of his state office.

4. During the four years ending June 30, 1918, the Fish and Game Commission collected the sum of $837,409.25, because under the laws of the state, it was its duty to collect said sum. This money was paid into the Fish and Game Preservation Fund by hunters, anglers and commercial fishermen who desired that it be used for the purpose of conserving fish and game and not that it be diverted into the general fund to be used for other purposes. It is their wish that these funds be spent on patrol, enforcement of fish and game laws, erection and maintenance of hatcheries, distribution of fish, installation of screens in ditches, fishways in dams and research, etc.

The fish canners and commercial fishermen, of their own accord, asked that a privilege tax be imposed on the taking of fish and that the money from this source be turned over to the Fish and Game Commission for the purpose of conducting investigations of the life history of fishes in order that the commercial fisheries might be further developed, new methods of fishing experimented with and proper legislation passed in order to conserve the fishes of this state.

Accounts of its receipts and expenditures are published more frequently by this commission than by any other state board or commission. "California Fish and Game," published by the commission quarterly, contains a full statement of all money expended by this commission each month, besides an account of the commission's other activities.

That the funds of the commission have not been unwisely or extravagantly spent is proven by the results obtained. The salmon run, which in the early '80s was practically exterminated by mining operations, was restored by the work of the

commission's hatchery department, so that in 1918 over twelve million pounds of salmon were caught, which retailed at an average price of 25 cents per pound, making the total value of the catch $3,000,000.

Striped bass, catfish, black bass, shad, blue gill, calico bass and other food fishes were introduced into the waters of this state by the Fish and Game Commission. As a result of this work, 1,400,000 pounds of striped bass were caught in California in the year 1918. They were retailed at about 25 cents per pound, or $325,000. During the last three years over twelve million pounds of shad were taken in California, from thirty to sixty-five carloads of roe-shad being shipped to the Eastern markets each year, retailing at not less than 20 cents per pound, making an average of $800,000 per year.

Catfish are also caught in large numbers. In 1918, 200,000 pounds, worth 25 cents per pound, or $50,000, were sent to our markets. The annual catch of these four species of fish introduced or re-established by the Fish and Game Commission is valued at $4,175,000. In fact, a total of 250,000,000 pounds of fish were caught in California during the year 1918. The fish packed by canners and curers, alone, were worth approximately $20,000,000, to say nothing of the fresh fish sent to the markets.

Surely an industry of such magnitude is worth protecting, and any money spent in investigating the life history of our food fishes can not truthfully be said to be extravagantly spent without achieving results, particularly when the fish introduced, propagated and protected by the commission bring into the State of California, $4,175,000 per year—over ten times the amount expended by the state in the protection, propagation and conservation of all fish and game.

As a result of the investigations by the experts of the commission, a new season and limit was adopted and the catch of crabs increased 40,000 dozen per year, valued at $100,000.

Besides the important work of the Fish and Game Commission in propagating and conserving commercial fishes, it has also propagated and distributed millions of trout and has stocked many waters which had been entirely barren of fish life. Bear Lake, an artificial lake in San Bernardino County, about eight miles long, was stocked by the Fish and Game Commission. Hatcheries and egg-taking stations were built and maintained there and the supply of fish kept up so that now the fifty or sixty thousand people who visit the lake annually obtain excellent fishing. In addition to Bear Lake, the commission has also planted trout and black bass in Huntington Lake, Bass Lake, Shaver Lake, Clear Lake, Juniper Lake, Medicine Lake, Rea Lakes, Sixty Lake Basin and many other lakes throughout the Sierra Nevada and the Coast Range mountains, too numerous to mention. In all of these lakes excellent fishing is to be had and they are annually visited by tens of thousands of anglers.

Innumerable barren streams in the Sierra Nevada Mountains and elsewhere in this state have been stocked with trout. All of the streams in the Yosemite National Park above the floor of the valley were barren of fish life before they were stocked by the Fish and Game Commission. Golden trout have been distributed from Volcano Creek throughout the Sierra Nevada Mountains, as far north as the Yosemite Valley.

The fishing in some of our best streams is kept up solely through the work of the Fish and Game Commission. When the run of black-spotted trout, the only trout indigenous to the Truckee River, was stopped by the dams in the river in the State of Nevada, the Fish and Game Commission planted Rainbow, Eastern Brook and Loch Leven trout in this most excellent fishing stream, so that, now, while black-spotted trout are seldom, if every caught, excellent catches are made of the varieties introduced by the Commission.

The banks of the Sacramento River on Sundays and holidays, in fact, nearly every day, are lined with anglers fishing for catfish, crappie, blue gill, calico bass and other exotic fish introduced into the waters of this state by the Fish and Game Commission.

The work of the Fish and Game Commission in the protection of the game resources of the state has also been productive of excellent results. Deer are admittedly much more numerous now than they were ten or fifteen years ago. Cottontail rabbits are becoming so numerous that the residents of Fish and Game District No. 2 and Fish and Game District No. 4 have asked this Legislature that the protection given cottontail and brush rabbits be removed and that they be placed upon the list of predatory animals which may be taken at any time.

As a result of the protection given pheasants, those planted by the commission have become so numerous in favorable localities, that open seasons for the taking of these birds are demanded in Inyo and other counties and will probably be granted by this session of the Legislature.

Quail and doves are holding their own in most localities. Wild ducks and wild geese, under the protection given them both by the state and federal government, are so numerous that in many localities, they are considered a pest, particularly in the rice fields of the Sacramento Valley and the grain fields in the lower San Joaquin Valley. In fact, there is now pending in the Legislature a bill providing that the protection given ducks and geese be, to some extent, removed, in order that the farmers of the state may obtain relief from their depredations.

5. The diminution in the number of cases made in the biennial period 1916–1918, is due to the vigorous campaign of education being carried on by this commission. The commission feels that it can obtain much better results by educating the people to a proper observance of the laws for the conservation of our fish and game, than it can by arrests alone. Apparently the commission is justified in this. Despite the fact that the patrol has been more efficient than at any other time, the number of arrests have decreased from 2,087 in 1914–16 to 1,797 in 1916–18. Among the activities of the Department of Education and Publicity which emphasize the motto, "Conservation through education," are:

a. "California Fish and Game," a quarterly magazine devoted to the conservation of fish and game in California, published, contains—

(1) Numerous articles on game species, means of identifying them, their past and present status and the means whereby they may be conserved.

(2) Statistics bearing on the abundance of game species.

(3) Reports of work accomplished by commission; activities initiated.

(4) Financial reports.

b. Publicity items in newspapers dealing with fish and game and the activities of the commission.

c. Magazine articles, *e.g.* "A New Goose for California." "Pernicious Bounty Laws."

d. Lectures on fish and game and its conservation illustrated with stereopticon and with motion pictures, given to schools, churches, teachers' institutes, boy scouts, summer camps, etc.

(1) Special series of lectures to university students.

e. Exhibits showing work and activities installed at State Fair and sportsmen shows.

f. Instruction relative to fish and game and the need and value of wild life conservation given in schools by means of lectures and trips afield.

(1) Teacher's bulletins issued furnishing teachers with usable information.

(2) Similar instructions given boy scout organizations at their summer camps.

g. Record of activities and accomplishments furnished the Governor and the people of the state through the medium of a biennial report.

h. Information on wild life furnished in reply to letters of inquiry.

The decrease in the number of cases can also be accounted for by the fact that at the 1917 Legislature, the sale of trout was prohibited, thus eliminating the many arrests that had theretofore been made of fishermen who caught trout for the market and who continually violated the law regarding both seasons and limits.

Furthermore, on account of the vigorous prosecution of cases by the commission, many violators have ceased to disobey the laws. For example, after Judge Murasky decided the case of *American Game Transfer* vs. *Fish and Game Commission* in favor of the commission, the merchants who had theretofore sold wild ducks illegally, practically quit doing so, and market hunters from whom they procured wild ducks discontinued their unlawful shipments.

6. At the urgent request of the anglers of southern California, the commission decided to build a hatchery to stock the streams and lakes of southern California and the western and eastern slopes of the southern Sierra Nevada Mountains, which were fished annually by thousands of people from Los Angeles and other portions of southern California. It emphatically and repeatedly demanded in writing of the Department of Engineering and Board of Control that the building should not cost more than $30,000. Plans and estimates were submitted by the State Architect, calling for a building to cost $29,500.

At a meeting held in the office of the Fish and Game Commission in the Mills Building, San Francisco, attended by John Francis Neylan, then President of the Board of Control; Mr. Dean of the State Architect's office; Frank M. Newbert, M. J. Connell, Carl Westerfeld, Fish and Game Commissioners; Ernest Schaeffle, Secretary of the Fish and Game Commission, and Mr. W. H. Shebley, Superintendent of Hatcheries, the commissioners attempted to question the representatives of the State Architect on the estimates submitted and were told emphatically by Mr. Neylan that neither he nor the representatives of the State Architect or the Department of Engineering or its officials, came to the commission to have their ability to estimate the cost of a building questioned by laymen; that the law provided that the amount set aside for the building must be turned over to the Department of Engineering and that if the plans were satisfactory, the commission would have nothing further to say about its construction. Furthermore, if the commission did not turn over $30,000 to the Department of Engineering, as provided by law, the Board of Control would not approve of the expenditure of one cent and the commission could not build the hatchery. Thereupon, the commissioners turned over $30,000 to the Department of Engineering, which assumed full charge of the construction of the building.

Before asking for plans and specifications for the hatchery to be built in Inyo County the Fish and Game Commission made an extended survey of all the streams in southern California, in order to obtain the best site possible for a hatchery. The temperature of the waters of numerous creeks was taken; the minimum and maximum

flow determined; the transportation facilities were examined; the needs of the surrounding country were investigated. After a most exhaustive examination, the present site on Oak Creek was chosen, and the results have fully justified the choice made. In view of the fact that nearly all the water in southern California was appropriated for irrigation, power or domestic use, the state was extremely fortunate to obtain such valuable water rights free of cost. These alone are of much greater value than the cost of the hatchery.

The fish produced at the Mt. Whitney Hatchery show much greater and better development than those propagated at any other in this state or anywhere in the world. The facilities for stocking the waters of the southern Sierras and southern California are better than those that could be obtained anywhere else in that section of the state and the people who are informed, are all of the opinion that no better site could have been chosen.

a. It is not true, as stated in the resolution, that there were no waters nearby needing to be stocked. On the contrary, there are numerous streams and lakes both on the western and eastern side of the southern Sierras, some of which are barren of fish life, in which trout ought to be planted. The headwaters of many of the streams flowing into the southern San Joaquin Valley rise in the western slopes of the Sierra Nevada, within easy range of the Mt. Whitney Hatchery.

b. It is not true that it is impossible to obtain a sufficient supply of trout eggs in the vicinity of the hatchery. On the contrary, an ample supply of trout eggs can be obtained from Rae Lake and Bear Lake, besides a bountiful supply of golden trout eggs from Cottonwood Lake, the only place in the world where these eggs can be obtained. In any event, it is much cheaper and easier to transport eggs to Mt. Whitney Hatchery to be hatched and distributed than it is to transport trout fry from Mt. Sisson Hatchery to the streams and lakes stocked from the Mt. Whitney Hatchery.

c. It is not true that the hatchery product must be transported a great distance or at a heavy expense. The lakes and streams of the southern Sierras and southern California can be easily reached and cheaply stocked from the Mt. Whitney Hatchery.

d. The hatchery product is loaded on the fish distribution cars at Owenyo, leaves there about five o'clock in the evening, and passing through the Mojave Desert at night, reaches Los Angeles and the southern portion of the San Joaquin Valley early the following morning.

7. The cost of maintenance and operation of the Mt. Whitney Hatchery is not extravagantly expensive nor out of all proportion to the benefit derived by the people of the state. From year to year the expense, instead of growing, will diminish on account of better facilities and the probable decrease in the price of food for fish.

The ground on which the hatchery is located was not purchased by the state, but was given to the state by the citizens of Inyo County. The commissioners are not aware who are the owners of the property adjacent to the hatchery site. At the time the hatchery was built, the land adjoining it immediately on the west was a part of the National Forest, owned by the United States.

The Fish and Game Commission of California has made a greater effort than any other state in the union to obtain accurate first-hand information relative to the present status and condition of the game and fish of the state. It has caused extended scientific research to be made, both as to the life histories of our game and our fishes.

Under the direction of Dr. H. C. Bryant and J. S. Hunter, the following investigations have been instituted:

a. Researches are being carried on by H. C. Bryant, Ph.D., game expert of the commission, and J. S. Hunter, in close co-operation with the University of California, Museum of Vertebrate Zoology, facilities and advice of the trained scientists of the university being available and used

b. Dr. Bryant, joint author of "The Game Birds of California," a 600-page book, published in 1918, detailing the life history, habits and past and present status of each species of game bird found in the State, sums up present knowledge of each species.

c. Investigations of the food habits of birds:

(1) Roadrunner proved an efficient destroyer of insect pests rather than an enemy of quail. Actual food consumed shown by stomach analysis.

(2) Study of food of ducks in progress. Will furnish information as to their relation to agriculture and will give evidence as to best food plants to attract wild fowl to the State. Natural foods suitable for use by the game breeder will also be apparent.

d. Compilation of dependable facts regarding game and its status. File kept; information furnished by forest officers codified; newspaper articles authenticated.

(1) Special report on fur bearing mammals; past and present status.

(2) Present status of beaver with map showing known distribution.

(3) Present status of prong-horned antelope with map showing present distribution and census of existing herds.

e. Statistics of annual kill of game.

(1) Deer. Estimate made from actual report of kill made by deputies and forest officers.

(2) Ducks. Estimate made from records showing shipments to market.

f. Investigations of disease attacking game.

(1) F. C. Clarke—disease attacking deer in Trinity County; proved to be a bladder worm.

(2) Dr. Bryant—disease attacking ducks in Sutter County, 1918.

g. Investigations of birds in relation to agriculture.

(1) Ducks versus rice. Joint investigation by Biological Survey and Fish and Game Commission.

(2) Blackbirds versus corn and other crops.

(3) English sparrow versus garden crops and beneficial native birds.

(4) Relation of meadow lark to agriculture.

h. Field investigations of game refuges.

(1) Trinity County Game Refuge; present condition; predatory mammals.

(2) Pinnacles Monument Game Refuge; present condition; predatory mammals.

i. Study of acclimatization of exotic species. Success and failure in the introduction of foreign game birds and mammals.

j. Study of methods of conserving wild life.

k. Scientific investigations of deer and their status in California by F. C. Clarke.

The following scientific investigations of the commercial fisheries of the state have been carried on, and many of them are still in progress under the direction of Mr. N. B. Scofield, in charge of the Department of Commercial Fisheries.

a. Investigation of Albacore, Sardine and Herring. Mr. Will F. Thompson, formerly with the Department of Fisheries of British Columbia, at present fishery expert in our laboratory at Long Beach, is making a scientific investigation of the life history of the albacore, together with a statistical analysis of the catch. He is also making a scientific study of the sardine and herring, as well as observations on a great many other fish. The greater part of the time, however, is spent with the albacore and sardine, in order that we may be prepared to cope with the many problems arising with the rapid development of these fisheries.

Mr. Elmer Higgins, who is a graduate of the Department of Zoology, University of Southern California, is assisting Mr. Thompson in the laboratory, collecting specimens and conducting experimental fishing trips on the patrol launch "Albacore."

b. Edwin Chapen Starks, assistant professor of zoology of the Leland Stanford Junior University (formerly curator of the museum, and instructor at the University of Washington), is writing a series of comprehensive articles on the results of his studies of the various fishes of this coast, which appear in our magazine, "CALIFORNIA FISH AND GAME," *i.e.*,

The Flat Fishes of California.
The Mackerel and Mackerel-like Fishes of California.
The Herring and Herring-like Fishes of California.
The Sharks of California.
The Skates and Rays of California.

c. Salmon. Arrangements have been made to complete the investigations of the life history of the salmon from Monterey Bay to the northern boundary of the state. Mr. Willis Rich, a well-known student in zoology, and J. O. Snyder, associate professor of zoology, Leland Stanford Junior University, formerly Assistant United States Fish Commissioner, naturalist U. S. S. "Albatross" and expert ichthyologist, will carry on the work. Mr. Rich has already completed a great deal of work on the salmon and Dr. C. H. Gilbert of Leland Stanford Junior University has carried on extensive experiments for the commission in marking and planting salmon fry.

d. Crab. A study of the Pacific Coast edible crab (*Cancer magister*) was made by Frank Walter Weymouth (assistant professor of physiology, Leland Stanford Junior University, A. B. Stanford 1909, A. M. Stanford 1911. In 1912 and 1913, assistant in physiology at the Johns Hopkins University), in the year 1911. As a direct result of his findings the size limit of crabs was increased by law and the catch of crabs in 1917 was increased 50 per cent over that of 1916.

e. Mollusks. In 1911 a complete survey was made of the California coast under the direction of Prof. Harold Heath, professor of zoology, Leland Stanford Junior University (A. B. Ohio Wesleyan, Ph.D. Pennsylvania), covering the mollusks of this region. W. W. Curtner, Will F. Thompson and Mr. Hubbs assisted in this work.

f. Crawfish. A crawfish investigation was made in 1911 by Bennett M. Allen of the University of Wisconsin. Later Waldo S. Schmidt of the United States National Museum came to this coast, and in 1918, with the assistance of our men and boats, was able to secure some specimens of young crawfish which will greatly assist him in his report of their life history.

g. Abalones. Mr. W. W. Curtner has made a complete study of the abalones of the State. Mr. Curtner is a graduate in zoology of the Leland Stanford Junior University.

h. Striped Bass, Sturgeon, Perch, Shrimps, etc. Mr. Scofield has himself conducted a great many investigations of our fishes, such as the shad, striped bass, perch, sturgeon, etc. He has also made a study of the shrimp fishery and has been able to prevent the use of the destructive Chinese method of shrimp fishing.

i. Kelp. During the Great War, when a sufficient amount of potash was not obtainable even at the increased price of $300 and $400 a ton, formerly $65 per ton, a study was made of the extensive kelp beds along the coast of southern California with the assistance of Mr. W. C. Crandall of the Scripps Institution and Dr. F. W. Turrentine of the United States Department of Agriculture, and regulations were made as a result of this study which enabled the harvesters to cut the kelp to the limit without unduly destroying the beds.

9. There is less than eight miles of the Truckee River in California below Floriston. Shortly before the present Board of Fish and Game Commissioners was appointed, the State of Nevada appropriated $10,000 to abate the nuisance caused by the pollution of the Truckee River at Floriston. Nevada's chief complaint was not that the alleged pollution was deleterious to fish life but that it rendered the water supply of the city of Reno unpalatable.

An action was commenced by the State of Nevada in the United States courts in San Francisco and much testimony was taken. It was not proven that the refuse was deleterious to fish. In fact, the testimony showed that the fish in the river below the point at which the refuse was discharged, were in good condition and fit for human consumption. The action commenced by the State of Nevada was thrown out of court. Thereafter, certain state officials of Nevada consulted with the Fish and Game Commission of California, with a view to abating the nuisance. F. A. Shebley and N. B. Scofield were sent by the commission to the Truckee River to make further experiments with the water affected. Numerous conferences were held and a committee consisting of W. H. Shebley, Superintendent of Hatcheries in California, Professor Dinsmore, Bureau of Chemistry, University of Nevada, and Mr. Block, representing the paper company, was appointed to go east at the expense of the paper company to investigate certain appliances to handle the refuse. The owners of the paper company agreed to install these appliances providing the manufacturers thereof would guarantee their efficacy. When the manufacturers would not do this, the matter was again taken up by Governor Boyle of Nevada and Mr. Thatcher, Attorney General of Nevada, with Governor Hiram W. Johnson of California, and Mr. Westerfeld.

As a result of this conference, a committee consisting of Hon. Arthur Arlett and W. H. Shebley, again investigated the condition of the river below Floriston and made its report to Governor Johnson. Mr. Westerfeld thereafter wrote Governor Johnson, asking that the Attorney General of the State of California be instructed to commence proceedings under the authority of *People* vs. *Truckee Lumber Company*, 116 Cal. 397, against the paper company to abate the nuisance. At the next session of the Nevada Legislature, another appropriation was granted by that state to again commence proceedings against the paper company. An action was thereupon instituted and is now pending in the Supreme Court of the United States.

10. Water Pollution. Practically nothing was done by previous boards of Fish and Game Commissioners to prevent pollution of the waters of the state. The present board has, however, made great strides in this work and it is safe to say that California now leads any other state in the Union in preventing the pollution of its waters.

In the last ten years many complaints have been filed in the courts against large corporations and individuals to stop the discharge of refuse matters into the waters of the state and vast sums of money have been expended by them in order to remedy the evil. For example, as a result of complaints filed in the courts by the Fish and Game Commission, the following named companies have expended the amounts set opposite their respective names to prevent pollution:

Pacific Gas and Electric Company	$200,000 00
Union Oil Company	18,000 00
Shell Company of California	40,000 00
Doheny-Pacific Petroleum Company and Associated Oil Company, jointly	20,000 00
Mason Malt Whiskey and Distilling Company	7,000 00
Southern Pacific Company	23,000 00
Monarch Refining Company	5,000 00
American Oriental Refining Company	2,000 00
Capitol Refining Company	1,000 00
Paraffine Paint Company	1,000 00
California Petroleum Company	1,200 00
Total	$318,200 00

Many fines have also been collected as a result of prosecutions commenced by the commission.

Other large companies which have complied with our requests, or demands, without prosecution, are as follows:

Standard Oil Company	$500,000 00
Southern Pacific Company	26,000 00
Northwestern Pacific Railroad Company	5,000 00
Coast Counties Gas and Electric Company	5,000 00
Coast Valleys Gas and Electric Company	3,000 00
Pacific States Refining Company	2,000 00
Atchison, Topeka and Santa Fe Railroad Company	2,000 00
Western States Gas and Electric Company	5,000 00
	$548,000 00
Brought forward	318,000 00
Grand total	$866,000 00

And in addition a large number of smaller companies and individuals have been compelled to cease pollution where such existed. In all cases where persons, firms or corporations have failed to comply with our demands they have been taken into court.

Three cases are now pending in the courts of San Luis Obispo County, two against the Union Oil Company for pollution of San Luis Bay, and one against the Tiber Pacific Company.

11. Screens. Prior to 1912 no systematic effort was made to cause the installation of screens and ladders. At that time the present commission created a department of screens and ladders and detailed two men to attend to this work under the supervision of the Superintendent of Hatcheries. Since that time, despite the fact that the law has been found defective in some respects, 862 surveys have been made and notices served on the owners of ditches to install suitable screens. At this date 518 screens have been reported as being installed and in effective working condition. Before May 15 of this year between fifty and sixty screens have been installed at the expense of several thousand dollars. For instance, the screens installed by the Sacramento-West Side Canal Company, the Anderson-Cottonwood Irrigation Company and the Southern California Edison Company, cost many thousands of dollars each.

The work of installing screens in ditches is being pushed as rapidly and as vigorously as conditions will permit.

Under the law as amended in 1917, at the suggestion of the commission, the California Oregon Power Company has, at an expense of $20,000, built a hatchery at the Copco dam on the Klamath River, and last month conveyed it to the state, together with dwellings, traps and other equipment necessary to operate the station.

12. Ladders. The present Fish and Game Commission in 1912 began a systematic survey in order to determine where fish ladders should be installed. As stated under the head of "Screens" (point 11), two men were detailed under the supervision of the Hatchery Superintendent to make these surveys and to draft plans to be given the owners or occupiers of the dam. Numerous ladders and screens were installed; under the law 47 hearings as to the necessity of the installation of screens and ladders were held by the commission and findings made and orders issued by the board compelling the installation of fishways and screens. To date a total of 209 surveys of dams have been made and the owners have been legally notified to install fish ladders in accordance with the plans submitted. Of this number 131 fishways have been constructed and have been accepted as being effective. The other cases are being pushed vigorously and in some instances actions have been commenced to compel obedience to the orders of the board.

13. At the 1917 session of the Legislature, the commission was instrumental in having sixteen large areas within national forests set aside as game refuges, aggregating 839,180 acres. Besides this, the commission has now established seven game refuges on privately owned land in sections where hunting is intensive and game needed such protection. Within the last six months, over 60,000 acres of private holdings have been set aside for this purpose.

The commission is now asking the Legislature that two new game refuges be created, one around Lick Observatory, the other in Kern County.

14. The branch office established at Fresno was abolished because the work done by that office could be more efficiently and economically handled by the San Francisco office. The officer who had been in charge of the Fresno office was retained in the service of the commission until he voluntarily asked to be given a furlough in order that he could operate a mine which he owned and also attend to his agricultural interests which demanded his attention.

15. The game farm at Hayward, California, was established in 1908, prior to the appointment of the present board. The grounds were leased for a period of ten years. This commission was willing to cancel the lease at any time, had it been able to make suitable terms with the owner. When the owner of the land sued the commission to

set aside the lease, the commission put in practically no defense, but Judge Murphy, who tried the case, nevertheless ordered the commission to maintain a game farm on the land until the expiration of the lease.

16. It is not true that the distribution of fish as carried on by the commission is unscientific, unduly expensive or that it results in the destruction in each year of a large portion of the fish so distributed.

Through the efforts of the commission, two fish cars, distributing fish all over the State of California, are hauled free of charge by the railroad. The greatest of care is taken to see that the fish are properly distributed and properly planted in the streams and lakes.

17. It is not true that the Fish and Game Commission failed to investigate the young salmon propagated and distributed in the Sacramento River. The Fish and Game Commission has heretofore caused such investigation to be carried on by Dr. C. H. Gilbert of the Stanford University and Mr. N. B. Scofield, fishery expert for the commission, and is now carrying on such investigation in conjunction with the Bureau of Fisheries under the direction of Mr. Willis Rich and Mr. J. O. Snyder of the Stanford University, Mr. N. B. Scofield and Mr. W. H. Shebley. Salmon fry are held longer at Mt. Shasta Hatchery and are larger when released than those reared by any other state or county.

18. The commission has not at any time been governed for political or personal or other inefficient or improper motives.

a. It has not dismissed trained or efficient employees without cause.

b. It has not employed or promoted or otherwise rewarded assistants or employees not deserving of such consideration.

c. The department is not demoralized or functioning inefficiently or at an expense out of all proportion to the results obtained. On the contrary, the work of the department is now being performed more efficiently, intelligently and economically than at any other time during its existence.

19. The force of wardens in the field is as great as the funds of the commission will permit. If the overhead has increased, it is caused by the increase of the clerical work connected with the commission's activities, and also by the rules and regulations laid down by the Board of Control.

Respectfully submitted.

FISH AND GAME COMMISSION.

CARL WESTERFELD, *Executive Officer.*

Fig 56. Yosemite Valley deer photographed in a snowstorm. Snow was falling at the rate of two inches an hour when these deer were photographed by A. M. Fairfield, March 6, 1919. Exposure 1/25 sec., stop, F 6.3.

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All material for publication should be sent to H. C. Bryant, Museum of Vertebrate Zoology, Berkeley, Cal.

October 21, 1919.

PERSUASION VERSUS COMPULSION IN FISH AND GAME CONSERVATION.

Legislati n is the time-honored method by which the body politic attempts to attain an object. When new roads are desired, the legislature is asked to enact the proper laws. When the public health is to be safeguarded, an act of the legislature is demanded. But beyond the mere placing of a law on the statute books is the necessity of making the law effective by means of law enforcement. Where the need for the laws is well realized there is little need of law enforcement; where they are poorly understood, time, energy and money must be spent to attain the object sought.

When, in fish and game conservation, we turn to this same time-honored method, the difficulties are just begun, for laws passed by the legislature must be enforced. Because of the failure of peace officers to do their duty, a large number of specially appointed game wardens must force people to obey the law.

Is there not a better way of attaining the same object? More and more we find campaigns of education being instituted to prepare the way for proper legislation. A city does not think of holding a bond election until after the people have been educated to the need for which the bonds are to be issued. Successful liberty loans have been effected by proper publicity almost to a greater extent than by the actual systematic canvass. The best example of accomplishment by means of an educational method rather than a legislative method is to be found in the success of the United States Food Administration.

How much better to have attained the goal by means of persuasion rather than compulsion!

If it is evident in attaining an object that the educational is of more worth than the legislative method because more fundamental, it seems reasonable that more time and energy should be devoted to this method in attempting the conservation of natural resources.

THE ANGLER VERSUS THE NET FISHERMAN.

The old controversy between the angler for sport only and the net fishermen for profit only, over the waters adjacent to Santa Catalina Island, has been revived recently.

It was thought that this matter had been definitely settled by action of the 1917 legislature in making two districts around the island, one in which net fishermen could operate and one for the benefit of the sportsmen only.

The promise of the cannery interests and net fishermen that they would not operate in a district dedicated to the sportsmen, provided a certain part of the waters surrounding the island be made a district in which net fishing should be permitted, would certainly seem to have settled the matter. However, it appears that this gentleman's agreement was not considered binding by some of the contracting parties.

About the middle of August, twenty-two canneries operating around San Pedro and some 340-odd alien fishermen who, not being able to maintain an action in the state court, cloaked themselves under the protecting wing of the canneries, obtained from the presiding judge of the Superior Court of Los Angeles County an order restraining certain individuals from interfering with their nets and boats, and further restraining them from making searches and seizures. This order was petitioned for under the plea that irreparable damage would be caused by the action of these certain named defendants, operating without due process of law.

The order was granted without previous notice to any of the defendants named in the petition. No mention was made in the petition that all of these

defendants were officers of the law, sworn to enforce the law, and that the actions complained of were performed in the pursuance of their duties.

The restraining order was served on H. B. Nidever, W. B. Sellmer and E. L. Hedderly, but no order was served at that time on the Fish and Game Commission. The order was also served on Ernest Windle, justice of the peace of Avalon township, Bates and Sutermeir, respectively deputy county warden and constable of Avalon township.

The hearing of the petition to make permanent the temporary injunction was held before Judge Valentine on August 19, 1919. The attorneys representing the plaintiffs in the action attacked the constitutionality of section 636 of the Penal Code, relating to nets, and also the description of District 20, as given in the act dividing the state into fish and game districts. They maintained that since the acts were void, the court had the right to restrain the public officers from enforcing the provisions of section 636. They also maintained that the state had no jurisdiction over the waters surrounding Santa Catalina Island, because the state constitution made no mention of a three-mile limit around the island. This latter contention was shown to be so absurd that it has since been abandoned.

The court took the stand that since a temporary order had been granted, it was up to the defendants to show cause why it should not be continued and made permanent. The defendants were given five days in which to present their opening briefs; the plaintiffs were given five additional days for reply, and the defendants were allowed five days further for their closing briefs. By this, it can be seen that the cannery interests gained fifteen additional days in which to make raids on the fishing grounds in District 20.

Immediately after the hearing, an order was served on the Fish and Game Commission restraining it from enforcing the law relating to net fishing in the waters around Catalina Island.

It is of interest to note, however, from the report of our deputies, that the fishermen have gained very little by their tactics, as their fishing operations have produced very poor results.

Judge Valentine having set aside the temporary restraining order September 10, 1919, the Fish and Game Commission has given instructions to its deputies to enforce the law in District 20. For the time being, it would seem that this decision in favor of the commission's contentions will effectually settle the controversy.—E. C. B.

Fig. 57. Children on a nature study field excursion, Al Tahoe, evidence of the success of the educational work carried on by the Fish and Game Commission in summer resorts this past summer.

EDUCATIONAL WORK IN SUMMER RESORTS.

The attempt to stimulate interest in wild life by carrying the Fish and Game Commission's educational campaign into the summer resorts proved very successful. During the month of July Doctor Bryant visited five of the largest resorts on Lake Tahoe: Brockway, Tahoe Tavern, Emerald Bay Camp, Al Tahoe Inn and Fallen Leaf Lodge. Lectures illustrated with stereopticon and motion pictures were given in the evening and parties taken afield in the day time. Of particular interest were the groups of children who roamed the woods and stream sides searching for wild things. It would be difficult to estimate the value of these excursions when the public at leisure came in contact with nature and learned the fundamentals of conservation first hand.

The final report shows that thousands of people were reached through the medium of lectures and that hundreds received instruction from a nature guide. The nature study reference books furnished by the California Nature Study League were in great demand and greatly helped in awakening interest in wild things.

It will be of interest to our readers to know that the Department of the Interior has decided to employ in each national park a resident naturalist whose duty it will be to answer questions and to interest people in the out-of-doors. Thus will the government augment the work already started by the commission.

The summer resort work at Tahoe proved so popular that an expansion of the work another summer will be demanded. There is no surer way of stimulating interest in wild life conservation than to develop interest in the out-of-doors when people are most susceptible to information about it.

Fig. 58. "Learning to read a roadside" at Emerald Bay under the instruction of a nature guide furnished by the Fish and Game Commission. An experiment in making conservationists out of the summer vacationists.

TAHOE PUBLIC CAMP.

The legislature at its last session set aside the old hatchery grounds at Tahoe City, which are to be abandoned for a better site, as a public camp for vacationists. Under the direction of the Fish and Game Commission the State Engineering Department installed a water supply, sewer system and other sanitary conveniences. The camp was opened to the public on July 4 with Mr. Arnold D. Patterson as superintendent. On the first day over a hundred campers were cared

for. The camp remained open until September 5. During the season 1,239 persons registered, but this number does not represent the total number accommodated. Further improvements are to be made in preparation for the crowds expected next summer.

and providing for a bag limit of one deer. Governor Smith, in signing the bill, stated that the law was in the nature of an experiment and that if it proved unsatisfactory it would be repealed.

Laws of this character, contrary to recommendations of those most interested

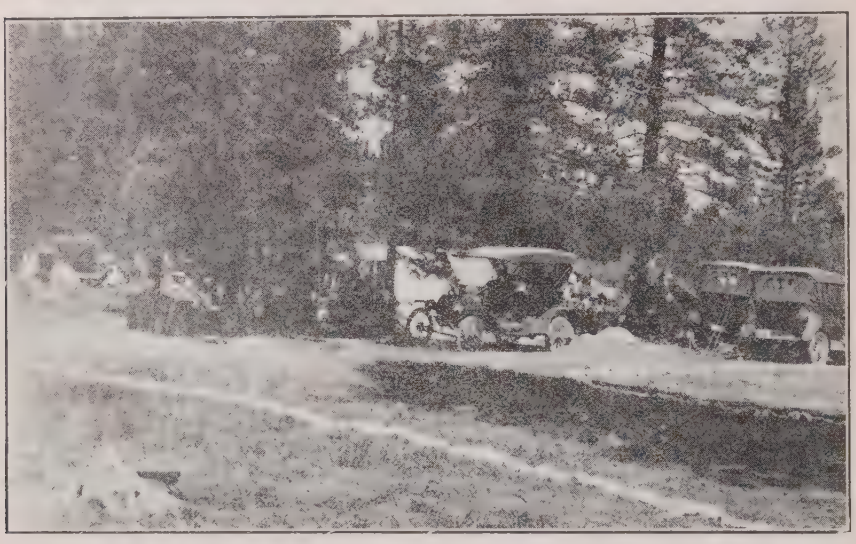

Fig. 59. Tahoe Public Camp on the old hatchery grounds at Tahoe City. Hundreds of campers availed themselves of the comforts of this free camp ground conducted by the Fish and Game Commission. Photograph by George Neale.

DEER CONSERVATION IN NEW YORK.

The state of New York is gaining some valuable facts by obtaining a census of the deer. The reports lead to a conclusion that there are in round numbers about 50,000 deer in that state. In 1917, approximately 37,000 men hunted deer and the total deer killed is estimated at 10,000. Records show that 5,888 Adirondack deer hides were received for tanning by different tanning companies.

Approximately 19,000 of the total number of deer are bucks. With a kill of 10,000 about 50 per cent of the bucks are killed each year. This is a toll already too great if the deer supply is to be maintained.

As a result of investigations a shorter season and a bag limit of one buck instead of two was recommended, but the legislature, influenced by selfish hunters, passed a bill allowing the killing of "any wild deer of either sex, other than fawns,"

in game conservation and contrary to the best experience of other states, are likely to prove costly experiments.

MIGRATORY BIRD TREATY ACT CONSTITUTIONAL.

The duck shooters of the country who have fought federal protection for migratory birds in an effort to defeat the law so that they might continue the destructive practice of spring shooting of waterfowl, have been decisively beaten on two occasions lately in the United States District Courts. This fact is made more interesting because on both occasions those opposing the law felt certain they would win. Their array of counsel was the best they could obtain. They chose their cases with due regard to decisions made in the past and with all respect to the local sentiment in the district where the trial was held. In fact, they left no stone unturned that would aid them in their fight to defeat the law, and still they

lost. The sportsmen of the country should feel highly pleased over their victory, for surely the law is valid or the organized fight against it would have met with at least some slight success.

On June 4, 1919 United States District Judge Jacob Trieber, of the Eastern District of Arkansas, who held that the original migratory bird law of 1913 was unconstitutional, handed down a very sweeping decision upholding the new law. This was the first jolt received by the spring shooters, but the knockout blow came later at Kansas City, Missouri, when Judge Arba S. Van Valkenburgh, on July 2, 1919, upheld the law in a decision so sweeping that a fitting comparison is Dempsey's decision over Willard a few days later.—*Bull. American Game Protective Association.*

WATERFOWL DIE FROM EATING SHOT.

Wild ducks and other waterfowl sometimes die from lead poisoning resulting from swallowing stray shot which they pick out of the mud about shooting grounds. Many ducks that become sick from lead poisoning finally recover, but it is probable that the effect is permanently injurious not only to the individual but to the species. It has been ascertained by experiment that lead greatly impairs the virility of male domestic fowls. Females mated with them lay many infertile egs, while in many of the eggs that are fertilized the embryo dies in the shell or the chick emerges weak and unable to withstand the hardships of early life. What effect lead poisoning has on female wild fowl has not been definitely ascertained, but, as the fact is well known that lead produces abortion in female mammals, there is a possibility that it exerts a bad effect on female waterfowl during the breeding season. Thus, the supply of waterfowl is likely to be decreased by lead poisoning not only by the number of birds that die directly from it but indirectly by impairment of reproduction.

These facts are set forth by the United States Department of Agriculture in Bulletin 793, "Lead Poisoning in Waterfowl," about to be published as a contribution from the Bureau of Biological Survey. Reports of waterfowl apparently sick from lead poisoning have been coming in for several years. The Biological Survey undertook an investigation at various shooting grounds to determine how common the taking of shot by waterfowl is, and a series of experiments to ascertain the effect of shot swallowed. It was found that at places where much shooting is regularly done from blinds, shot at the bottom of the shallow water are so numerous that one or more was found in practically every sieveful of mud or silt, and that they are swallowed by waterfowl whenever found as a result of this habit of swallowing small, hard objects to supply grit for the gizzard.

The experiments have shown that shot swallowed are gradually ground away in the gizzard and pass into the intestines, producing a poisoning that results in progressive paralysis and, usually, death. Experiments with wild waterfowl captured when young and reared in captivity—to obviate the possibility of their having taken lead before the beginning of the experiments—have shown that six pellets of No. 6 shot constitute an amount of lead that is always fatal. Two or three shot were sufficient to cause death in several instances. In one experiment, two mallards were given one No. 6 shot each. One of them died in nine days and the other was able to throw off the poison.

The list of species known to have been poisoned by eating shot consists of mallard, pintail and canvas-back ducks, the whistling swan, and the marbled godwit, but many other species, particularly of ducks and geese, are undoubtedly affected by it, according to the bulletin.

Unfortunately, nothing can be done at this time to protect waterfowl from lead poisoning except to call attention to the malady and to make known its cause and symptoms. The department, however, desires statistics on the numbers and species of birds affected and asks that sportsmen and others report to the Bureau of Biological Survey all cases that come to their attention.

GOVERNMENT NEEDS DEPUTY CHIEF GAME WARDEN.

The United States Department of Agriculture is in need of a well-qualified man, not less than twenty-five nor more than forty-five years of age, to fill a vacancy in the position of deputy chief United States game warden, and the United

States Civil Service Commission will give a most practical open competitive test to secure the right man. The entrance salary will be between $2,500 and $3,000 a year. Headquarters will be in Washington, D. C.

The duties of the position are to assist in administering the law which gives effect to the treaty between the United States and Great Britain for the protection of migratory birds and the sections of the United States Penal Code known as the Lacey act; in the supervision of United States game wardens and deputies in the gathering of evidence and the preparation of cases for prosecution of alleged violations of the federal game laws, and in office administration; and to participate in conferences in and out of Washington with individuals and organizations interested in wild life conservation.

In accordance with its practice in connection with positions of this class, the examination given by the Civil Service Commission will not require the applicants to appear in an examination room for a mental test. Those who apply will receive a rating on their education and practical experience, weighted at 80 per cent, and on a thesis on a selected game-conservation subject, weighted at 20 per cent. Those who attain a passing grade will later be given an oral test to determine their personal qualifications for the position. Failure in this oral test will render the applicant ineligible for appointment.

Applications will be received by the Civil Service Commission up to and including October 28. Full information and application blanks may be obtained from the secretary of the local board of civil service examiners at the post office or customhouse in any of 3,000 cities, or by writing to the United States Civil Service Commission, Washington, D. C.

ANGLERS, ATTENTION.

At last we have landed the articles on angling you have been looking for. All of the fine points of angling will be discussed. Read the first of the series which treats of dry-fly fishing on page 169 of this issue and watch for the other articles in the series furnished by "R. L. M., California," than whom there is no better writer on the subject.

ADDITIONAL MIGRATORY BIRD TREATIES NEEDED.

In order to complete our program for the protection of migratory birds, it is as necessary for them to be protected in the countries in which they sojourn during winter months as in the territory where they breed and spend their time in spring, summer and autumn.

It is therefore imperative that treaties be entered into with the republics of Mexico, Central and South America for the protection of birds that, in the course of their annual migration, pass from or through the United States and temporarily sojourn in such countries. It is a startling fact that wild duck are slaughtered by the millions in Mexico by pothunters, many of whom use masked batteries, and that they are sold in the markets for the pitiful sum of three cents each.

It is regrettable that the republics lying to the south of the United States have no game laws, but in the event those countries enter into treaties with the United States government for the protection of migratory birds, in order to carry out the terms of such treaties, such countries will be required to enact and to enforce laws making such treaties effective.

A campaign of education should be at once inaugurated in the Latin-American republics for the purpose of bringing to the attention of the people the economic value of birds and game, and the relation of these resources to the comfort, happiness and recreation of man.

The question is, can the migratory wild life withstand the onslaughts made upon it for mercenary purposes by irresponsible individuals in the Latin American republics, without being subjected to certain depletion and ultimate extinction?

Should the sportsmen of the country concur in the views briefly set out in this short paper, let them bestir themselves by addressing communications to their members of congress, and urging their active influence and assistance in making the treaties between the United States and the Latin-American republics, for the protection of migratory birds, an accomplished fact.—JOHN H. WALLACE, Commissioner, Dept. Game and Fish, Montgomery, Alabama.

STATE FAIR EXHIBIT.

The Fish and Game Commission's exhibit at the State Fair at Sacramento, August 30 to September 9, 1919, was the most pretentious yet attempted and proved to be the biggest attraction at the fair. A capable engineer was retained to draw the plans and Mr. Wm. F. Dabelstein, an artist of San Francisco, executed them. The whole north end of the new Agriculture Building was given over to the exhibit. The main feature of the exhibit was a cyclorama of the Sierras with Mounts Shasta, Lassen and Whitney looming up in the background and in the foreground the south end of Lake Tahoe

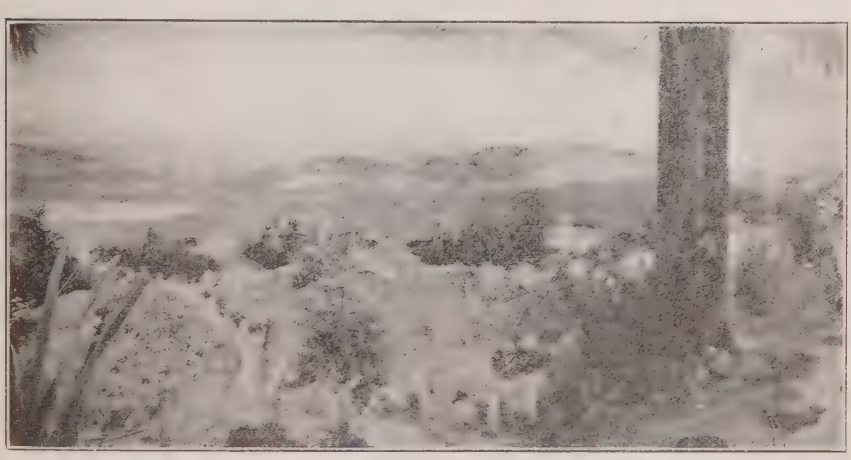

Fig. 60. The Fish and Game Commission's exhibit at the State Fair at Sacramento which took the form of a panorama of the High Sierras with Mount Shasta and Lake Tahoe at the left and Mount Whitney with a miniature of the Mount Whitney Hatchery at its base at the right. The exhibit was pronounced the finest on the fair grounds.

at one end and a miniature of the Mount Whitney Hatchery at the other. Several miniature waterfalls tumbled down the rocks into an artificial lake filled with trout. The whole scene was made still more attractive by a system of lighting which successively showed the gray light of dawn, the rosy tints of sunrise and the light of full day.

Arranged in front of the panorama were four large aquaria. Two of them showed common introduced fish such as black and striped bass, blue-gilled sunfish, crappie and catfish, a third showed different varieties of trout and a fourth was filled with the famous golden trout of the Mount Whitney region. Great interest was shown in the golden trout, and no wonder, for their bright colors would attract anyone. The hardiness of this variety of trout was evidenced by their vigorous good health while in the aquarium. Not a fish was lost in transit, nor did one die during the ten days duration of the fair. The publications of the commission were on display and wild life films were shown in the motion picture theater twice daily.

GAME CENSUSES.

Many states are inaugurating a game census to determine the distribution and comparative abundance of different varieties. New York requires the wardens to report regularly on all game seen and also requires a report of the game taken, from each license holder. Minnesota has just inaugurated a similar census to be made by wardens. Although such censuses will doubtless give a basis for estimating the abundance of game, yet such reports are necessarily so inaccurate that California has not instituted similar work. It may be that at some future date California will follow the lead of these other states.

In the meantime J. S. Hunter, assistant executive officer, is contemplating a different sort of a census—one which would perhaps bring in more dependable data with less work. The number of cartridges sold in the state, if it were

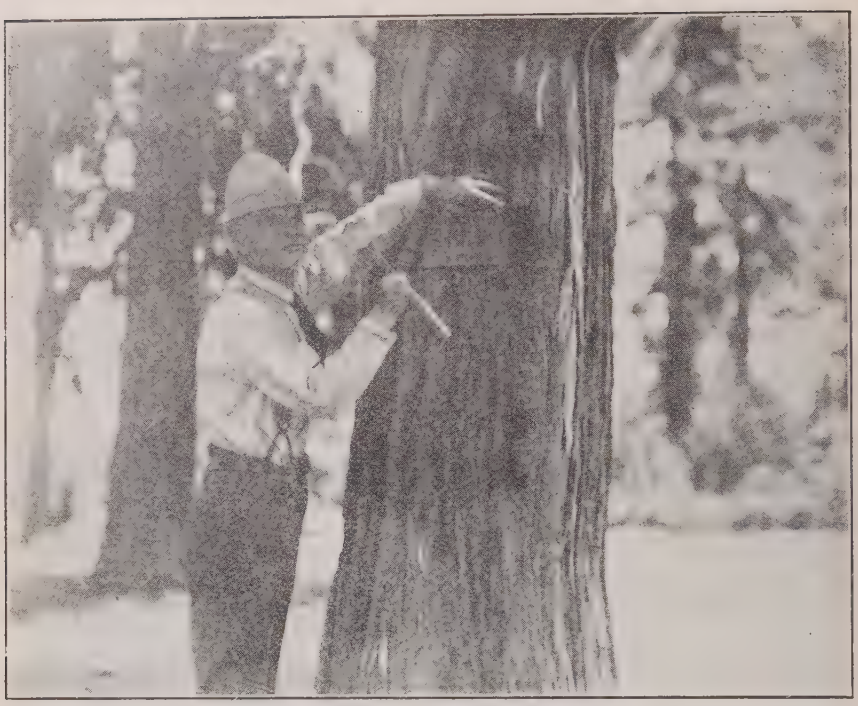

Fig. 61. Posting a game refuge. Suitable signs now mark the boundaries of our refuges. Photograph by H. C. Bryant.

known, would allow an estimate of the game killed. Different sorts of cartridges are used for the different kinds of game birds and mammals and with due allowance for game missed the total kill could be approximated. The securing of data along these lines would not be as difficult as the requiring of reports from wardens and hunters.

HATCHERY DEPARTMENT MOVES.

The Fishcultural Department, headed by Mr. W. H. Shebley, has moved to Sacramento, where temporary offices have been established in the Forum Building pending the more commodious quarters being prepared in the new Capitol Building. All correspondence connected with the Hatchery Department should hereafter be addressed to Fish and Game Commission, Department of Fishculture, Forum Building, Sacramento.

COLORED PRINTS OF GOLDEN TROUT AVAILABLE.

A few copies of the beautiful lithograph of the golden trout which appeared as the frontispiece of the Trout Number of CALIFORNIA FISH AND GAME are available for distribution. Libraries and schools are urged to procure copies for framing. Send a two-cent stamp.

FACTS OF CURRENT INTEREST.

A number of aliens who have purchased citizens' hunting licenses have found that it does not pay. In each instance they have had their license confiscated and been made to pay a $50 fine.

Splendid fish have been reared at the Yosemite and Kaweah experimental hatcheries, thus demonstrating the feasibility of constructing permanent hatcheries at these stations.

State lion hunter J. Bruce recently succeeded in bagging four lions in Tuolumne County.

Plans are under way for a State Fisheries Laboratory to be located near San Pedro. This will furnish working quarters for the scientific staff of the Department of Commercial Fisheries and will give room for an educational exhibit showing the work of the department.

Nearly three-quarters of a million golden trout were successfully reared at the hatcheries this year. Most of them will be planted in the Southern High Sierras, but some will be placed in the Tahoe region.

So great was the demand for the Trout Number of **CALIFORNIA FISH AND GAME** with its colored plates that the supply is practically exhausted.

Hundreds of campers availed themselves of the public camp on the hatchery grounds near Tahoe City this past summer. It will be remembered that several acres of land were set aside for campers by the last legislature.

Several additional wardens have been employed this past summer to help patrol the state game refuges. Added protection has also been accorded by the eight aeroplane patrols established by the United States Forest Service.

Ducks are again dying from alkali poisoning in the Marysville Butte region of the Sacramento Valley.

COMMERCIAL FISHERY NOTES.

N. B. Scofield, Editor.

THE SALMON OF THE SACRAMENTO NEED MORE PROTECTION.

It is believed that the Sacramento salmon are not being adequately protected and that serious depletion may now be taking place. Within the last few years the salmon fisheries at Monterey and Point Reyes, which draw upon the Sacramento supply, have grown enormously, and as they have grown the catch on the Sacramento has been correspondingly less, in spite of the fact that the number of nets on the river has increased and that on account of the higher price the fishermen fish more persistently.

The present fall season on the Sacramento remains open at least two weeks too long. Several years ago the season closed on September 16. It was contended by fishermen and dealers that the salmon were running later each year and they succeeded in obtaining an open season until September 20. Later the season was continued until September 25. The object of the closed season is to protect at least one-third of the run in order that they may pass up the river unhindered by nets and cast their spawn in the headwaters and by so doing insure a continuous future supply of salmon. With the present season, one-third of the run is not protected, for by the closing date, September 25, the last of the run or so much of it as is left has passed the nets in San Francisco Bay, San Pablo Bay, Carquinez Straits and Suisun Bay, a distance, favorable for the use of nets, of nearly fifty miles. The salmon work up the bays and river slowly and after the run has passed the lower bays the fishermen move up and continue to catch them in the lower river until the season finally closes. The wonder is that any escape. The salmon which have escaped make their way to the spawning grounds which are located mainly in the tributaries, Mill Creek, Battle Creek and McCloud River. In each of these tributaries a spawn-taking station is operated to collect salmon eggs for the hatcheries. The number of salmon reaching these stations is becoming less each year so that the number of eggs that may be taken is now only about one-fifth what it was only a few years ago. This decrease in the number of fish reaching the spawning grounds is a sure sign of overfishing and it is self evident the salmon should be protected from this overfishing.

The Sacramento also has a spring run of salmon or rather what is left of a once large spring run. The salmon of this run enter San Francisco Bay during the winter and early spring and after escaping the trollers outside they have to run the gauntlet of gill nets through the bays and the river as far up as Colusa. Above Colusa, as far as Vina, every place the river sweeps round a bend with a sandbar on the inside of the turn there is a seining outfit which periodically sweeps the deep hole where the salmon congregate preparatory to ascending the next shallow stretch of the river. There are some fifteen of these outfits operating on the "seining bars" on the upper river. And the salmon can not escape these seines which sweep the holes where they collect except during periods of very high water. On the river below Colusa and in the bays, there is no closed season to protect this spring run. On the river above Colusa the season closes May 15, but this date is so late the run is all but over.

There is no salmon stream in North America where nets are allowed for so great a distance up the stream as on the Sacramento. The number of salmon taken in these seines is not great, but they are the remnant of the spring run and they are a thousand times more valuable for propagating the species than for food. The hatchery of the United States Bureau of Fisheries at Baird on the McCloud River is the only hatchery which has collected spawn from the spring salmon run, but at this hatchery they have not attempted to take eggs from this run for the past six years for the reason the number of salmon reaching that point had become so small it was deemed insufficient to warrant the expense of operating.

Two things are quite obvious to anyone who knows the facts. Seining and gill netting in the upper river should be pro-

hibited and the fall season should close earlier so as to give some measure of protection to the larger and more important fall run. Trolling in the open sea possibly should be restricted. Investigations which were begun this year by the Fish and Game Commission under the direction of Dr. J. O. Snyder are expected to throw light on this point.

STRIPED BASS TAKEN IN MISSION BAY, SAN DIEGO COUNTY, CALIFORNIA.

Mr. A. G. Pearson of San Diego reports that on or about June 20, 1919, he took several small striped bass ranging from five to eight inches in length, in San Diego River near its outlet into Mission Bay.

On October 26, 1916, eighteen hundred small striped bass were planted near the mouth of San Diego River by the Fish and Game Commission, and since that time small striped bass have on several occasions been observed near the place of planting. As far as is known, only the one plant has been made in southern California and striped bass have never before been reported south of Monterey Bay. The fry at the time of planting were between two and three inches long, being fish of the year, spawned in April or May, 1916. If these fry had grown at the rate they do in San Francisco Bay they would have reached the size of five to eight inches in 1917, during their second year. If the fry reported by Mr. Pearson are some of the fry liberated in 1916 they are in their fourth year and their rate of growth has been remarkably slow. It is suggested that these five- to eight-inch fish are the progeny of the fish planted in 1916, but that can hardly be as a sufficient length of time has not elapsed, for it is pretty certain that striped bass do not spawn earlier than their fourth year and the fish planted in 1916 would not complete their fourth year until the spring of 1920. It would seem more probable that striped bass plants have been made of which we have no record or else striped bass which are plentiful in Monterey Bay have strayed to the south and occasionally spawn as far south as San Diego.

The striped bass is not native to the Pacific coast, but was introduced from the Atlantic coast in the early seventies and since that time has become quite plentiful.

KELP HARVESTING MAY BE RESUMED.

During the period of the war nearly four thousand tons of kelp were harvested each year in California waters. Upon the signing of the armistice practically all harvesting ceased as potash could not be extracted from the kelp economically enough to compete with the foreign potash which it was expected would be imported again in large quantities. In extracting potash from kelp many by-products were obtained which had never before been obtained in commercial quantities. As yet most of these by-products have not found a market. Much progress was made in developing more economical methods of obtaining the potash from kelp and it was hoped that if a market could be found for the by-products the kelp plants could continue to operate, but the armistice came sooner than expected and the plants closed down. Since then efforts have been made to place a duty on foreign potash, but as yet congress has taken no definite action. Efforts have also been made to find markets for the by-products and now one or more new companies which believe they have found the solution expect to resume the harvesting of kelp. The future of the industry will depend less on the value of the potash extracted than on the other chemicals which should be valuable when commercial uses for them can be found.

SARDINE RUN AT MONTEREY.

The sardine season at Monterey has been earlier than that usually considered normal. Canneries were running full capacity during July and August. During August the run was exceptionally large and the fish unusually firm and of good quality. This year there were more crews fishing sardines than ever before, forty-five crews operating, or an increase of seven crews over last year. The shortage of cans during the fruit season greatly curtailed the size of the sardine pack, which otherwise bid fair to break all records for this locality.

STEELHEAD.

It is often said by sportsmen that steelhead trout do not take the hook in open salt water. As contrary evidence a 3½-pound (cleaned weight) steelhead was caught July 23, 1919, on the hook in the open Monterey Bay and the local fishermen cla'm that such a catch is no great rarity. Several steelhead were also taken this year on the Mendocino County coast by the same method while fishing for salmon. During the summer of 1910 many steelhead were taken, during a period of six weeks, by trolling off Soquel in Monterey Bay. Many of the trout were caught a mile off shore.

SEAWEED AS FOOD.

The Chinese consider some of our seaweeds a very desirable basis for soups and several Monterey Chinamen make a business of catering to this demand. The weed is sun-dried and sacked, but held in the sack for further drying before shipment. During the last five months about 1,450 pounds, dry weight, have been shipped to such eastern points as Chicago, Cleveland, San Antonio and Newark.

SALMON AT MONTEREY.

The king salmon season just closed at Monterey resulted in one-half the normal season catch. The early run was not caught heavily because of a fishermen's strike and the late season run was light and ended early. The run of silver-side salmon was also light, but extended over a longer period than is usually credited to this fish. The silver salmon is said to suddenly appear in Monterey Bay, run heavily for a few days and suddenly disappear, but notes kept on the 1919 season show them as caught in small numbers between May 10 and July 26, with a heavy catch on four or five days during the period.

DRY SALTING FISH AT MONTEREY.

There are at present twelve firms engaged in the business of hard or dry salting fish at Monterey, representing an approximate investment of $50,000. One firm has invested $7,000 in equipment since last year. In addition, there are eight fresh-fish dealers who do considerable dry salting during otherwise slack periods. Several firms that operated last year have not yet opened up for business, September and October being the big months in the hard salting industry. The chief product is sardines in the form of salachini pressed into round 100, 65 and 50 pound tubs. Anchovies are usually put up in 5, 8 and 10 pound cans although some anchovy and sardine paste is made. Mackerel is salted in 200-pound barrels.

As yet the trade will not take any great quantity of these relatively new products on this coast, but the hard salt business promises to develop into a well established and increasingly large industry in the future.

SQUID AT MONTEREY.

This year for the first time in several years squid have been caught in quantity at Monterey. Three Chinese firms have dried this season about 1,772,000 pounds (fresh weight) of squid. Three tons of wet squid furnish one ton dried. Due to high labor cost this year the squid were not cleaned, merely dried on the ground, raked up and sacked. Fishermen were paid $10 per ton for the catch and the dried product sacked ready for shipment is valued at 6 to 7 cents per pound. Practically all this sacked product is shipped to China.

In addition, small quantities of squid have been canned in half pound rounds. The appreciation of fresh squid as a table delicacy is slowly growing, but people who delight in oysters and eels usually balk at squid tentacles till they have tried them once.

DO FISHERMEN GO FAR ENOUGH TO SEA TO GET THE FISH?

It is the belief of some of the canners of southern California that such pelagic fish as the tunas and albacores may be found in large numbers farther off shore than the fishermen usually fish. As the tuna canning industry has grown the fishermen have been getting larger boats and are fishing, during the latter part of the season, twenty to thirty miles off shore. Incoming ships have observed what they have taken to be schools of long finned tuna ("albacore") some two hundred miles off shore. To determine if

these fish are abundant at this distance off shore the Fish and Game Commission's launch "Albacore" was detailed to make an investigation and succeeded in finding albacore in abundance near San Nicholas or about eighty miles off the mainland. If these fish can be found in numbers at a greater distance off shore, larger fishing boats will be built and preparations made to fish farther at sea when tuna are not to be found closer to shore.

LARGE SALMON CATCH AT FORT BRAGG.

While the salmon catch this summer at Monterey was only half the usual amount the catch of salmon by trolling has been exceptionally large in the vicinity of Point Reyes in Marin County and near Fort Bragg and Shelter Cove on the northern California coast. The data has not yet been compiled, but it is believed the catch at Point Reyes as well as the catch near Fort Bragg has been double that of last year.

THE SACRAMENTO RUN OF SALMON.

After the opening of the season on the Sacramento River August 1, salmon ran in small numbers until August 28, when the fishermen began to get large catches in their gill nets and everything indicated that what is termed the "fall run" was on. The fish appeared to be larger than average and several very large individuals have been recorded. One was landed at the plant of the Western Fish Company at Pittsburg which exceeded seventy pounds in weight. No scales were taken from this salmon in order that its age might be determined, but judging from other large individuals whose age was determined from an examination of their scales it was not less than seven years old.

The appearance of the salmon being delivered at Pittsburg early in September would indicate that they would spawn early this year. They had more the appearance of fish which run three weeks later and it was argued by the fish dealers that the salmon run would end much sooner than usual.

Fig. 62. Looking down the Noyo River from the boat harbor at Noyo, California. This is the center of the salmon fishing industry of the north coast. Wonacotes photo.

Fig. 63. Scene on Noyo River showing salmon fishing boats. Wonacotes photo.

NOTES FROM THE STATE FISHERIES LABORATORY.*

By Will F. Thompson and Elmer Higgins.

THE RECURRENCE OF THE FRIGATE MACKEREL.

In California Fish and Game for October, 1918 (Volume 4, Number 4, page 183), the first occurrence of the frigate mackerel, *Auxis thazard*, was noted. This was one of the remarkable features of the unusual summer season of 1918. At that time small catches were made in company with catches of skipjack (*Euthynnus*), yellow-fin tuna and some mackerel (*Scomber*). This year slightly larger individual boat catches were made of the frigate mackerel, but as the majority of the canneries refused them, they were not brought in as often. One catch of five tons was recorded by a single boat on the nineteenth of August. The first noted by the writer came in on the seventeenth of August, and the last on the twenty-second. Other catches at earlier and later dates were undoubtedly made, but the data have not yet been obtained from the statistical records. The average weight of these fish was 1.3 pounds before cleaning, and the loss of weight in cleaning and preparing for canning was very high. Therefore those canneries which accepted the species at the start of the run later refused to take any except for fertilizer.

It may be noted in connection with this species that mention of very young tuna or albacore may refer to the taking or observation of schools of the frigate mackerel. Fishermen unfamiliar with them, as was usually the case, were inclined to promptly refer them to the young of other species of the tuna group, frequently the blue-fin.—W. F. T.

*California State Fisheries Laboratory, Contribution No. 12.

THE SPAWNING OF THE GRUNION.

In Fish Bulletin No. 3, relating to the spawning of *Leuresthes tenuis*, the grunion, there is given on page 14 a chart showing the relation of the tides to the spawning times. As the paper was published on July 15, before the spawning season was over, no spawning periods were shown in July and August. However, since then, runs were observed on July 15, July 16 and August 14.

The runs on July 15 and 16 were small, but larger than that on August 14. The full moon occurred July 13 and August 11 (Greenwich mean civil time). Mr. Henry Shands, a field assistant for the laboratory, observed the run during July in the absence of the writer, and states that it was noticed by a considerable number of people, who remained on the beach to collect the fish. The run during August was observed by the writer, but so few fish were noticed that it seemed an accident to have taken them at all. Hence, although the fish were obtained on but one night, this fact does not mean that grunion did not run the usual three nights. No people were observed on the beach capturing the fish, this fact corroborating the observed small size of the run.

It will be noted, from the above-mentioned chart, that August 14 was the last date on which the grunion might be expected to run during the year 1919.—W. F. T.

CONTRIBUTIONS TO CANADIAN BIOLOGY.

Among additions to the library is a series of publications from the Canadian Biological Stations,* being studies made under the direction of the Biological Board of Canada, Professor E. E. Prince, Commissioner of Fisheries, Chairman. Included with them is a volume devoted to the Canadian Fisheries Expedition (Department of the Naval Service 1919), during which material was gathered for studies of the Canadian herring, the eggs and larvæ of the eastern coast of Canada, the hydrography of the region, etc., by Dr. Johan Hjort, and various associates. The publications are noteworthy, aside from the undoubted merit of the contributions, in that throughout many recent numbers there is an attempt to apply to American species the technique developed during the study of European fisheries by the International Council for the Study of the Sea.

The volume published under the direction of Dr. Johan Hjort includes in its covers two papers which are in good part general in character, dealing with the principles of the Norwegian work on the life history of the herring and of hydrographic work, the former by Einar Lea and the latter by J. W. Sandstrom. These papers will well repay the perusal both of the beginner and of the investigator, especially in the absence of general works dealing with the subjects.—W. F. T.

*Contributions to Canadian Biology, Supplements to the Annual Reports of the Department of Marine and Fisheries, Fisheries Branch, Ottawa, Canada.

BLUE-FIN AND YELLOW-FIN TUNA.

The catch of blue-fin tuna during 1919 was largely the work of purse seine boats, operating during the last part of the season in the northern waters around Santa Cruz Island. However, during the height of the run off Catalina Island, the schools invaded the prohibited waters of District 20. The statistics of the catch obtained during the subsequent weeks do not, therefore, give an accurate idea of the *abundance* of the fish because of the attempts of the seiners to evade the law, and the issuance of an injunction (August 13) against deputies seeking to enforce it. They are accurate, of course, in regard to the quantity taken.

A potential source of more serious error in statistics arose during the last part of August in the confusion by the weighers of yellow-fin with blue-fin tuna. The albacore boats began, about the twenty-fifth of August, to bring in numbers of large yellow-fin tuna (*Germo macropterus*), landing them at the canneries, in company with many smaller tuna. A close examination of these fish throughout the period of their run, which was not over on September 2, proved these fish to be usually of the one species, the "yellow-fin" tuna. It will be, in fact, a safe procedure to call nearly all tuna caught by albacore boats (other than combination net boats, which were not operating) during this period this species, in contradistinction to the blue-fin tuna

landed by the purse seine boats. But that even this leaves a certain error is undeniable, numbers of blue-fin tuna being brought in.

This is, incidentally, the first year in which these large yellow-fin tuna have been taken in this quantity in these waters. Last year the yellow-fin tuna taken were small, always under 30 pounds, while this year 75-pound fish (cleaned) were not rare, and one of them weighed 175 pounds cleaned, and was 65 inches in length. In fact, the blue-fin, or leaping, tuna did not exceed the size of these fish. It was not to be wondered at that these large, magnificent fish were at once called leaping tuna, traditionally the largest of our species.

However, the writer has satisfied himself by careful examination of a considerable series of fish that confusion need arise but very rarely between the species. Careful measurements have been taken of the body and fin proportions and compared according to standard methods used by ichthyologists in distinguishing species, but the more obvious characteristics may be reviewed here for the use of those who wish them, in view of the need for accuracy in statistics.

Color. The high fins above and below the fish (dorsal and anal fins) are usually tinged with yellow in the yellow-fin tuna, while they are as a rule dark in the blue-fin. The small finlets behind these are usually a brighter yellow in the yellow-fin.

The lower side of the body in both species bears characteristic markings, especially in the young. In the yellow-fin the marks tend to arrange themselves in alternate narrow transverse lines and rows of spots, and are smaller than those of the blue-fin, in which the spots are generally in transverse rows without intervening lines. In both species these spots become lengthened toward the tail. When freshly caught the yellow-fin, the young especially, has a strong lemon yellow tinge over most of the body, which is lacking in the blue-fin.

Pectoral fin. The length of the long side fin is the most obvious and reliable character by which the species can be distinguished, but very rarely a yellow-fin is found with a short fin. In the yellow-fin this side fin is almost always slightly shorter than the head, measured from the tip of the snout, and is not less than five-sixths of its length. In the blue-fin, this side fin is always less than two-thirds of the head length, and usually but three-fifths.

Head. The yellow-fin tuna has, as a rule, but not invariably, a shorter head than the blue-fin has.

Trunk of the body. The yellow-fin has a very noticeably shorter trunk than the blue-fin, if the "trunk" is considered the length before the two fins situated above and below the body. This holds only when fish of a size are compared and very large fish are likely to be hard to distinguish. The posterior part of the body where the finlets are is nevertheless more drawn out in the yellow-fin in comparison with the rest of the fish. Up to a certain length the fish seems to grow faster posteriorly, the young yellow-fin of 25 inches in length being similar in this characteristic to blue-fin of 45 inches.

Height of fins. The height of the two fins, one above and one below the body (dorsal and anal), differ markedly in the two species, but only when specimens of a size are compared. Yellow-fin tuna have higher fins (or longer, according to the way they are considered) but a yellow-fin of 30 inches in length has fins about as long in proportion as a blue-fin of 45 or 50 inches, although those of a 45-inch yellow-fin exceed the length of those of the blue-fin by a fourth of their length.

The eye. The eyes in the blue-fin tuna are actually nearly equal to those in yellow-fins of the same size, but because of the larger head in the blue-fin, they appear much smaller. The diameter of the eye in the blue-fin averages 3.2 per cent of the length of the body, and is about one-ninth of the head length, whereas that of the yellow-fin is 3.2 per cent of the body length, but about one eighth of the head length.—W. F. T.

THE OCCURRENCE OF THE LOUVAR.

On August 6, a large fish was brought into the canneries at Fish Harbor, San Pedro, from the west end of Catalina Island, and excited much comment as a probable hybrid between a pompano and a yellowtail. This proved far from the truth, however, the specimen in reality being a member of the "wide-ranging"

species *Luvarus imperialis* Rafinesque, once previously recorded from Catalina Island by Jordan & Starks in 1906 (as taken by Dr. C. F. Holder). It was an exceedingly active fish and very difficult to handle, although the small mouth and fine bristle-like teeth do not indicate predaceous habits.—W. F. T.

THE ABSENCE OF THE DOLPHIN FISH.

In 1918 the dolphin fish, *Coryphæna*, was frequently taken in local waters, and this fact was then often cited as evidence of a bad year for the fishing of albacore. However, this year the dolphin has not yet been in evidence (September 15), as far as we are able to determine, although the albacore season is far from normal. Indeed, the similarity between 1918 and 1919 is marked, the skipjacks (*Euthynnus*) having been running in quantity as they did last year, the frigate mackerel having appeared again, and the year being remarkable as before for the predominance of the tunas.—W. F. T.

TWO RARE FISHES.

To the lists of fish, new or rare in southern California waters, previously published may be added two species which came to the laboratory in June.

Four specimens of the pomfret, *Brama raii* (Bloch), were taken from a gill net near San Pedro by Mr. E. M. Nielson. The pomfret is an excellent food fish found in open seas, widely distributed, but taken only occasionally on our eastern or western coasts or in Europe.

Several specimens of *Cololabis saira* (Brevoort) were sent to us from San Diego by Mr. P. B. Clark, where they were taken along with a school of sardines in a round-haul net. The species is recorded from several localities on our California coast but is said to be very rare. This same species is occasionally found in large schools in Japan.—E. H.

THE "DAY" AND "NIGHT" SURF-FISHES OF NORTHERN CALIFORNIA.

Captain A. C. Tibbetts of Eureka, California, writes to the undersigned as follows:

" * * * state that the 'grunion' is the fish known here as the 'night surf-fish.' There is another known as the 'day surf-fish,' both varieties being caught in dip nets, in the same locality, viz, between Trinidad and Mad River. The Indians catch and dry these in large quantities. The 'day-fish' is larger than the 'night-fish,' has a yellowish tinge, the flesh is softer, and to my taste is inferior to the 'night-fish.' On the ninth instant (of August) I saw both kinds on sale at one of the Eureka markets. Small coasters running to the Klamath River bring occasionally to this place what is termed 'candle-fish.' These, even when salted and smoked, burn freely if a lighted match is applied to the tail. The Klamath River, as far as I know, is the only stream near here that furnishes this fish. All three of the above fishes have the appearance of smelt."

One of these species is *Thaleichthys pacificus*, the eulachon or candle fish; another is probably *Hypomesus pretiosus*, the surf-smelt, but we are not at all sure that the third is the grunion, *Leuresthes tenuis*. Both *Mallotus villosus*, the capelin, and *Leuresthes tenuis* are surf spawners and might possibly occur, and as the latter has not as yet been recorded north of Long Beach, considerable caution should be used in reaching a decision.—W. F. T.

THE OCCURRENCE OF THE ALBACORE NORTH OF SAN FRANCISCO.

Captain A. C. Tibbetts has also informed us that on September 22, 1884, he captured three albacore off the northern coast of California. His letter reads in part as follows:

"While in command of the schooner 'Volant,' I was coming from the westward, bound for Humboldt Bay, and instead of getting northerly winds as expected at this time of year, the wind came in fresh from the southward, increasing to a strong southeaster as we approached the coast, resulting in our closing with the land to northward as well as to leeward of our port. The wind after some hours moderated, and changed to light northwest. While running for Humboldt Bar, at four to five knots speed, somewhere between Redding Rock and Trinidad Head, I noticed fish working the same as they sometimes do on the coast of southern California, and out of curiosity threw a cod line with a white rag on the hook over the stern, and when the line straightened out got an albacore. Caught three, as fast as they could be unhooked and the line put out again. The fish appeared to be abundant, but those taken were dirtying things up around the after part of the deck, so fishing was stopped."

Captain Tibbetts is familiar with albacore, having taken them south of San Francisco. He believes the long southerly blow had reversed the usual coastal current and brought warmer water with it. Extracts from his log-book are given in his letter.

He also (October 17, 1883) records the occurrence of skipjacks (presumably *Euthynnus*) in considerable numbers 120 miles west of Trinidad, over what he thought to be a small uncharted area of shoal water, but in an area not now traveled to any extent.—W. F. T.

CONSERVATION IN OTHER STATES.

NEW YORK OPENS NEW HATCHERY.

The Conservation Commission of New York announces that the new fish hatchery at Dunkirk has been opened. This is the largest and most completely equipped of the twelve hatcheries maintained by New York and will be used largely for the propagation of the lake or greenback herring.

GAME REFUGES IN MINNESOTA.

Game refuges may be established without hearing in the state of Minnesota when all landowners concerned join in a petition. A public hearing is required otherwise. All state parks and state forest reserve lands are game refuges.

WASHINGTON FORMS STATE SPORTSMAN'S ASSOCIATION.

Washington sportsmen have formed an organization to further the interests of all the sportsmen of that state. The object is to assist in the propagation and protection of game animals, birds and fish, to influence legislation toward this end, and to promote such social conditions as are incident to the sport of hunting and angling. Its rapid progress voices itself in the slogan, "One thousand members in 1919."

QUEBEC ESTABLISHES BIRD REFUGES.

Great bird colonies situated on islands in the Gulf of St. Lawrence have been set aside as game refuges by the parliament of the province of Quebec. There are three definite areas in the county of Gaspe which are included. The first, known as Perce Rock, a breeding place for herring gulls and crested cormorants, Bonaventure Island with the largest surviving colony of the gannet, and the celebrated Bird Rock, the northernmost of the Magdalen Islands. Rigorous provisions of

Fig. 64. Deer captured while swimming in Lake Tahoe. Photograph by J. Sanders.

the law prohibit the molestation of the birds' nests or eggs, the carrying of a gun or other hunting gear within a mile of the refuges. Any boat used in violation of the law is liable to confiscation and heavy penalties of fine or imprisonment are provided.

PENNSYLVANIA PUNISHES VIOLATORS.

Severe sentences are becoming the rule. In the *Fishing Gazette* we read that Clyde Wilsoncroft and Roy Reynolds of Drury's Run, Pennsylvania, were arrested by the state police for illegal fishing. Each had sixty-five trout in his possession. The men were given a hearing before Squire Griffey, of Revono, and fined $650 each, or $10 for each trout caught. Not being able to pay the fine, both men must serve 650 days in the county jail.

LIFE HISTORY NOTES.

WEIGHTS OF MULE DEER.

Extravagant statements regarding the weights of mule deer are current. Most weights given are mere estimates. It is worth while, therefore, to record the weights of two bucks taken in the Granite Mountains, Washoe County, Nevada, about September 1, 1908. Careful weights taken on steelyards showed 217 pounds and 220 pounds after the entrails and feet had been removed. A dressed forked horn weighed 180 pounds.—F. P. Cady.

DEER CAPTURED IN LAKE TAHOE.

On January 26, 1919, Henry Sall, the caretaker of the Hellman resort on Lake Tahoe, discovered a deer swimming in Lake Tahoe about three-quarters of a mile out from land, and he immediately took after it in a boat. It was in an exhausted condition, and showed marks of having been attacked by a coyote or other animals. Mr. Sall took the deer home and took special care of it, and Mr. Hellman procured a permit from the Fish and Game Commission to keep it. After keeping the deer in captivity for a week carefully chained, it was given its freedom, and since then it has never strayed away from the property even though it has absolute freedom to roam over 43 acres of ground. It has adopted the house cat, seven setter dogs and one Airedale dog. The deer appeared to be about eight months old when captured. Its mate was found later by J. E. Pomin of Idlewild, near the Hellman property, partly devoured by coyotes.—Joseph H. Sanders.

OREGON CÆSARIAN FAWN A MOST HEALTHY LITTLE ONE.

At Neskowin, Tillamook County, Oregon, during the summer of 1917 deer hounds were heard back in the mountains.

Fig. 65. Cæsarean fawn successfully reared in Oregon. Photograph by Raymond Walsh.

Soon they appeared on the beach, having driven out a doe. The weary doe made for the breakers and started for the rocks, then well covered with water. Later when the tide receded a search was made for the deer. She was found on the rock, but in an effort to reach safety her front

leg was broken. But, sadder yet, she was with fawn. Her life was taken and a Cæsarian was quickly undertaken by the rancher. The wee twin buck had been injured and was dead, but "Fawnie" was soon ready to eat. It was miles to any hygienic nipple and bottle, so one was improvised with a cork and straw. A bed and warmness was soon provided, but in a few days the little beggar preferred the hard floor—perhaps it was more like the sunny mountain side. Soon she was weaned and drank from the cup. Days and weeks passed, and what a pet! She was ever free to return to the mountains at any time, but she liked her foster mother too well. Later she was sent to the State Hospital Farm near Salem, where she is now well cared for.—JANE FRY WALSH.

UNITED STATES FOREST SERVICE CO-OPERATION.

RANGERS CO-OPERATE WITH GAME WARDENS.

Probably in no season since the Forest Service began its active campaigns of fire protection, road building, and the surveying of summer home sites and other projects which tend toward making the summer vacations of the mountain-loving people of California more attractive and

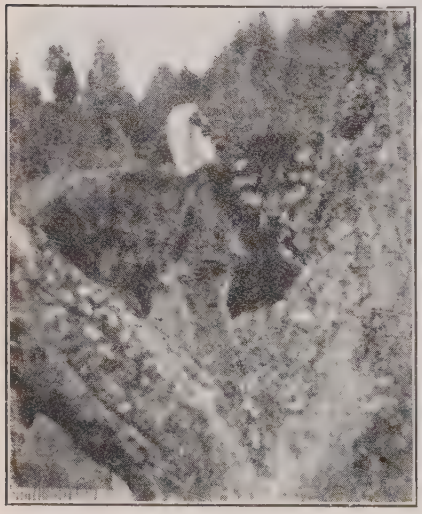

Fig. 66. Young mountain lion captured near Helena, Trinity County, California. Photograph by H. W. Brannan.

beneficial, has it been so handicapped by the lack of experienced men as it was during the summer of 1918. It was the war, of course. But in spite of the fact that it was not able to put on so many men as formerly during the summer, and in many cases one man was doing the work of two in ordinary years, no lack of interest was displayed in its co-operation with the Fish and Game Commission. A sincere interest in the protection and perpetuation of the game resources of the state is evident in all the reports from the Forest Supervisors, and in many instances it is the forest rangers who come forward with constructive suggestions for the improvement of game conditions. This is due partly to the fact that all Forest Service officials know that wild life is as much a natural resource as timber, and that it should be used wisely and under the proper regulations, and partly because they wish to assist the State Commission through its local representatives who are in many localities a part almost of the Forest Service organization, good fellowship and mutual help being the rule between rangers and game wardens.

DEER IN THE NATIONAL FORESTS.

In looking over the reports we find that 2,943 deer were killed in the National Forests last season. This is an accurate record and is only what is actually known of the kill. In many cases the Forest Supervisors say that this does not represent the actual kill, which might readily be estimated at 10 or 15 per cent higher. In most localities they are holding their own and in some a decrease has been noticed. The chief factors which affect and have a direct bearing on the number are the extension of the road system under the spur of the autoist, and the increasing number of people who spend part of their vacation in the mountains. The most serious factor is the apparent increase in the coyotes and mountain lions. The campaign conducted by counties, the Biological Survey and the state has not yet (from the reports) been

intensive enough to rid the mountains of these pests to any appreciable degree. Unless it is carried on more forcefully we are liable to see a steady, if not rapid, decrease in the deer. Where sheep are grazed in the mountains during the summer months the coyotes seem to prefer them as a more easy prey than the deer, attacking the latter only in the winter. But where few sheep are grazed the reports are emphatic in the assertion that coyotes do more damage than the hunters. In parts of the Klamath Forest it is impossible to raise sheep or goats unless kept within a fence, and in other sheep raising countries the coyotes take a serious toll every year.

The mountain lion is even a more implacable foe of the deer than the coyote, and if it should become as widespread in its range and habitat it would mean the sure and early doom of the deer. Fortunately, at present, the Klamath, Trinity, Shasta, California, and Santa Barbara Forests are the only ones that report serious trouble, although the El Dorado, Stanislaus and Sierra report an increase in the numbers of lion in the last year. Here the trouble is traced to the Yosemite National Park, which has been a breeding ground for them, as no hunting or trapping is allowed except by Park Rangers or government hunters. Higher bounties and more vigorous prosecution of the work of extermination of both the lion and the more prevalent and destructive coyote are vigorously recommended.

OWENS VALLEY RESIDENTS ALL GO FISHING.

A fishing day for the Owens River Valley, when almost the entire population closes stores and homes and goes out to catch the first trout of the season, has, according to Supervisor Jordan, become an established institution.

STRANGE DEER KILLED.

Ranger Harley of the Klamath Forest reports the killing of a pure white deer and a pure black one, and adds that he has seen a third and greater wonder in the deer line, one with white head, neck, legs and belly, and cream colored sides and back.

REPORTS.

SEIZURES—FISH, GAME AND ILLEGALLY USED FISHING APPARATUS.

March 1, 1919, to June 30, 1919.

Game.

Deer meat	345 pounds
Ducks	32
Doves	3
Quail	12
Deer heads	2
Aigrettes	59

Fish.

Smelt	8 pounds
Halibut	3,650 pounds
Trout	78 pounds
Barracuda	1,591 pounds
Striped bass	1,971 pounds
Black bass	9 pounds
Catfish	178 pounds
Salmon	475 pounds
Yellow fin croaker	23,600 pounds
Crabs	1,031
Pismo clams	1,933
Abalones	383 pounds
Abalones (dried)	1,157 pounds
Lobsters	8
Dried shrimps	1,200 pounds
Set lines	3
Illegal nets	3

Searches.

Illegal fish and game	23

CALIFORNIA FRESH FISHERY PRODUCTS. COMPILED BY DEPARTMENT OF COMMERCIAL FISHERIES—APRIL, MAY, JUNE, 1919.

Species of fish	Del Norte, Humboldt	Mendocino, Sonoma, Lake	Marin	Solano, Yolo	Sacramento, San Joaquin	Tehama, Glenn, Colusa	Contra Costa, Alameda	San Francisco, San Mateo	Santa Cruz	Monterey	San Luis Obispo, Santa Barbara, Ventura	Los Angeles	Orange	San Diego	Total	Mexico
Albacore												375,221		277,745	652,966	17
Anchovy			146,100					499		76,040		249,062			471,692	
Barracuda												1,749,273	37,840	535,436	2,322,549	22,719
Blue fish									13	11,773					11,786	
Bocaccio								6,168	70	161,575					167,813	
Bonito											23	34,679	274	29,935	64,911	375
Carp		3,455		1,634	42,468		10,013	13,252							70,852	
Catfish		9,725		6,351	46,503		24,359								86,938	
Chilipepper								125,827		931					126,758	
Coalfish								22,520		715					24,235	
Cultus cod	254	8,263						320,028	6,304	8,826		1,791			345,469	
Dogfish							273	20,475		3,152	475	8,396		56,344	89,039	
Eel								10							10	
Flounder	1,050		730	1,335			269	152,988	4,785	439	725	1,479	61		163,631	
Greenfish												2,405			2,405	
Hake								37,575	6,855	710		959		2,870	48,989	
Halibut	4,948	24,772	465					8,312	854	3,726	116,506	522,809	33,419	180,160	895,001	101,485
Hard head					5,397										5,397	
Herring	150		16,670				1,470	3,710							22,000	
Kingfish								14,351	12,614	36,813	193	37,766	21	674	102,432	
Mackerel									7	16,016	2,799	761,737	2,473	18,230	801,262	2,115
Marlin																
Mullet												270			270	
Perch	8,442		31,559				47	1,884	5,933	228		569		880	49,022	1,140
Pike				8	752		141								901	
Pompano								67	571	41		2,019		199	2,897	
Rock bass											58	57,156	880	94,760	152,774	120
Rockfish	3,718	993						99,583	21,518	50,639	36,929	103,529	61	102,757	419,457	20,315
Salmon	17,752	409,172	12,252	315,350	90,984	148,614	468,832	60,756	482,556	2,014,266					4,020,543	
Sand dab								215,656	15,389	1,100	183	2,258			334,689	
Sardine								4,825	95,525	3,079,720		22,067,551		4,260,642	28,639,598	
Sculpin												5,427			5,427	
Sea bass (black)											295	4,780	175	9,573	14,823	2,982
Sea bass (white)			171						2,553	96	3,275	720,033	295	27,051	753,877	2,510
Sea trout												5,193		2,001	7,194	
Shad				40,179	83,730		3,717	8,385				25			136,036	
Shad (buck)				143,815	14,050		270,875								428,740	
Shad (roe)				175,989	16,671		737,931								930,541	

Sheepshead													456		200	656	
Skate								92,832					315			93,147	
Skipjack													9		104	113	10,635
Smelt	14,081		20,132					29,916	12,761	11,783	613	26,608	375	2,752	119,024		
Sole		15						1,167,333	174,682	25,569	11,980	18,399		222	1,398,200		
Splittail					187										187		
Striped bass			771	92,935	53,700		102,726	49,077							299,209		
Stingaree																	
Suckers					360		43								403		
Surf fish																	
Sword fish																	
Tom cod								13,021							13,021		
Trout (farm)																	
Trout (steelhead)																	
Tuna														33,165	33,165	164,511	
Tuna (blue fin)																	
Tuna (yellow fin)												1,659,119			1,659,119		
Turbot			1,030					183				331,729			332,942		
White bait			36					2,792							2,828		
Yellowtail											191	421,653	26	381,014	802,894	4,580	
Miscellaneous					599			5,001	28	1,328	18,945	151,128	162	2,804	179,995	3,903	
Total fish	50,395	456,398	229,916	777,585	355,401	148,614	1,620,696	2,577,480	843,224	4,636,851	192,990	29,323,807	75,982	6,019,498	47,308,837	337,437	
Crustaceans—																	
Crabs (doz.)								20,996	120	8					21,124		
Ecrevisse (doz.)																	
Shrimp								256,232							256,232		
Spiny lobster																	
Mollusks—																	
Abalones	450									33,550	151,738				185,738		
Clams (cockle)			9,040									211			9,251		
Clams (mixed)	6,860		13,261					80				55			20,256		
Clams (pismo)											138,553				138,553		
Clams (soft shell)		3,565	11,631				73,387								88,583		
Cuttlefish								1,299	142	809	107	3,812			6,269		
Mussels	140						1,600				2,779	2,432			6,951		
*Oyster (shell) No.			252,450												252,450		
†Oyster, lbs.			22,985												22,985		
Snails																	
Squid									92	3,612,357		6,622			3,619,071		
Miscellaneous—																	
Frogs (doz.)								305							305		
Terrapin (doz.)	2	2						63							67		
Turtle																2,239	

*Eastern. †Native.

VIOLATIONS OF FISH AND GAME LAWS.

March 1, 1919, to June 30, 1919.

Offense	Number of arrests	Fines imposed
Game.		
Hunting without a license	7	$155 00
Deer—close season—killing or possession	22	460 00
Female deer, spike bucks, fawns—killing or possession	2	50 00
Running deer with dogs—close season	1	25 00
Illegal deer hides	1	25 00
Refusing to show license on demand	3	35 00
Selling an eagle	1	5 00
Nongame birds—killing or possession	5	55 00
Cottontail and brush rabbits—close season—killing or possession	3	75 00
Wild pheasant—close season—killing or possession	1	100 00
Tree squirrel—close season—killing or possession	1	
Goose and mudhens—close season—killing or possession	1	25 00
Ducks—close season—killing or possession	1	50 00
Golden eagle in possession	1	25 00
Doves—close season—killing or possession	3	50 00
Quail—close season—killing or possession	3	75 00
Black sea brant—close season—killing or possession	1	
Total game violations	57	$1,210 00
Fish.		
Angling without license	16	$430 00
Fishing for profit without a license	19	160 00
Refusing to show license on demand	1	25 00
Clams—undersize—close season—taking or possession	9	250 00
Crabs—undersize—close season—taking or possession	10	80 00
Using a set line	2	
Offering trout for shipment by parcel post	2	50 00
Trout—close season—excess limit—taking or possession	17	410 00
Trout—taking other than by hook and line	2	50 00
Catfish—undersize—offering for sale	3	60 00
Salt water eels—undersize—taking or possession	2	120 00
Using a fish trap	1	100 00
Dried shrimps—possession	2	
Abalones—close season—undersize—taking or possession	26	550 00
Spring lobsters—close season—undersize—taking or possession	4	80 00
Sturgeon—close season—undersize—taking or possession	2	40 00
Black bass—close season—undersize—taking or possession	1	20 00
Black bass—taking other than by hook and line	1	50 00
Striped bass—undersize—excess limit—taking or possession	2	30 00
Perch—buying or selling—close season	1	20 00
Selling young fish for bait	1	100 00
Taking salmon with snag hook	3	300 00
Buying and selling salmon taken in District No. 1—close season—excess limit	1	20 00
Using a net less than ½-inch mesh for bass	1	
Pollution of waters	132	$2,985 00
Total fish violations	189	$4,195 00
Grand total fish and game violations		

STATEMENT OF EXPENDITURES—YEAR 1919.

Items of expense	January	February	March	April	May
General administration	$1,770 04	$2,079 71	$1,903 79	$2,220 16	$2,172 26
Research, publicity and educational (game)	280 68	242 33	349 62	368 16	259 82
Printing	841 07	722 18	78 89	102 51	628 86
Fish exhibits					
Game exhibits					
Tahoe camping ground					
Mountain lion bounties	1,140 00	680 00	980 00	890 00	470 00
Lithographing hunting licenses					
Lithographing angling licenses					
Hunting license commissions	1,675 00	631 90	1,533 90	1,162 70	1,006 50
Angling license commissions	1,090 10	215 70	894 20	1,234 90	623 10
Market fishing license commissions	10 00	25 00	230 50	149 50	103 00
Hunting lions					
	$6,807 09	$4,596 72	$5,970 90	$6,127 87	$5,263 54
San Francisco district	$6,115 72	$6,009 58	$5,851 79	$6,383 82	$6,491 09
Sacramento District	3,936 85	3,825 74	4,225 44	4,235 63	4,662 93
Los Angeles District	2,504 87	2,627 60	2,379 75	2,524 90	2,397 03
Launch patrol	1,048 47	1,112 90	1,008 73	1,059 40	6,233 47
Prosecutions (fish and game)	129 45	64 00	86 60	67 25	260 00
Crawfish inspections	200 00	200 00	300 00	100 00	58 06
Winter game feeding					
Accident and death claims	124 04	161 10	124 04	155 05	124 04
	$14,059 40	$14,000 92	$13,976 35	$14,526 05	$20,226 62
Hatchery administration	$987 20	$980 29	$977 96	$1,168 05	$1,245 86
Mount Shasta hatchery	2,097 03	1,403 00	1,704 90	2,527 52	4,425 23
Klamath station	487 82	111 00	5 00	56 60	5 00
Fall Creek hatchery	448 12	792 86	1,020 13	1,039 91	798 70
Mount Whitney hatchery	1,070 01	2,046 22	1,184 98	1,572 61	1,676 33
Cottonwood Creek station		163 75	161 65	217 67	82 81
Cottonwood Lakes station				22 12	2 55
Tahoe hatchery	6 00	5 00		5 00	5 00
Tallac hatchery	5 00	5 00	354 07	501 50	1,276 49
Chico experimental station					

Item of expense	January	February		April	May
Fort Seward hatchery	368 50	322 41	279 50	348 47	336 07
Eel River station	28 77				
Ukiah hatchery	1 50			214 90	547 32
Snow Mountain station	91 83	377 05	427 10	382 14	241 00
Brookdale hatchery	391 44	488 46	278 22	236 15	283 91
Scott Creek station	61 00	92 47	70 00	140 76	69 05
Feather River hatchery		1 20			
Almanor hatchery	12 44	367 40	154 00	172 50	186 52
Domingo Springs hatchery			202 25	191 75	238 72
Clear Creek hatchery					57 75
Bear Lake Hatchery				200 00	
North Creek station	1 03	19 75	386 86	723 17	990 51
Wawona hatchery					178 45
Yosemite hatchery			15 48	371 58	194 22
Kaweah hatchery				148 10	129 58
Fish transplanting	3 00	3 00	3 00	3 00	3 00
Screens, fishways and water pollution	456 36	545 09	649 30	712 69	809 78
Special field investigation					
Department of Commercial Fisheries	$6,517 05	$7,723 95	$7,874 40	$10,954 93	$13,783 85
	2,449 80	2,647 27	2,836 84	2,796 35	3,377 57
	$29,833 34	$28,968 86	$30,658 49	$34,405 20	$42,651 58

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